

June, 1959

# The Mining Magazine

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# The Mining Magazine

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<i>C. F. Davidson</i>			

## EDITORIAL

**E**ARLIER this month the Mond Nickel Company provided an opportunity of seeing a film showing the refining of copper obtained from the Sudbury nickel ores. Molten metal from the smelter is transferred in ladle cars to the refinery at Copper Cliff, a mile and a half away, and there it is poled and de-slagged to make anodes for the electrolytic plant. At that stage approximately 99% pure it emerges as cathode copper going 99.97%. The film, particularly in the furnace shots, is most dramatic in character and it is welcome news that it is available free of charge to technical societies and industrial organizations.

**A** USEFUL little booklet has recently been issued by the Copper Development Association. This is, in fact, the third in a series giving a selection of abstracts of contemporary literature in the utilization of copper and its alloys; it is to continue to appear monthly. The booklet is intended to supply the needs of those who wish to be kept informed of current developments in the technology of the metal and is supplementary to the Association's Technical Survey, which is now incorporated in their journal *Copper*. The subject matter is classified under a series of headings—such as, production, refining and recovery, technological properties and applications, corrosion, powder metallurgy and physical metallurgy, electrical applications, mechanical and general engineering, and salts and compounds.

**C**ONCERNED with all aspects of mining a new committee has been set up by the International Organization for Standardization. Meeting in Essen in April for the first time the committee agreed: (1) To establish specifications relating to machinery and equipment (excluding preparation and processing); (2) to unify practice in the presentation of plans and drawings, and (3) to unify methods of calculation of mineral reserves and to unify terminology. Future work is

expected to include mine supports, wire ropes, mine locomotives, tubs and mine cars, shaft guides, protective clothing and safety equipment, and certain aspects of flameproof equipment.

**A**DDRESSING the Institution of Mining and Metallurgy following the annual meeting last month the new president, Dr. J. H. Watson, submitted "Some Observations on Gold Refining and the Standards for Gold and Silver Coinage." Dr. Watson is, of course, Chemist and Assayer at the Royal Mint and thus well qualified to deal with this interesting subject. Following a review of methods of refining the precious metals he went on to deal with changes that have been made in the composition of the coinage of the United Kingdom, which has always been checked by the assay of coins compared with that of an equal weight of a standard or Trial Plate of similar or known composition, such plates being preserved at the Mint. This Trial of the Pyx, a very ancient ceremony, is still carried out, the judges being an impartial body, completely independent. Gold sovereigns, it was interesting to learn, are still being made; indeed, in 1958 the Royal Mint coined 10,000,000 such coins of 22-carat gold, test enough of the respect in which our standards are still held abroad.

### Metal-Mining Potentialities of the United Kingdom

At the conclusion of the Symposium on "The Future of Non-Ferrous Mining in Great Britain and Ireland" arranged by the Institution of Mining and Metallurgy last autumn Professor K. C. Dunham was asked to submit a report on its proceedings for the United Kingdom Metal Mining Association. This report became available last month and copies have been sent to the President of the Board of Trade and to the Lord President of the Council, with an accompanying letter of recommendation from the Association.

Professor Dunham in an introduction refers briefly to the past record of the non-ferrous metal-mining industry in these islands, an industry once substantial and profitable. He classes the Cornwall-Devon field as an area of first-order importance as a producer of metallic minerals, instancing its substantial contribution to the tin and copper industries and points out that there were in addition several lead-zinc areas of "second-order" importance. He goes on to suggest that the evidence discussed at the Symposium was sufficient to promise that concealed, as yet undiscovered, ore deposits may be expected to occur in a number of districts which might well form the basis for a revival of metal mining in the United Kingdom. He goes on to indicate a number of specific projects which, on the evidence available, may be considered the most promising and for these he suggests a preliminary exploration programme of geological, geophysical, and geochemical investigation, followed by boring if required. Dr. Dunham thinks that Government aid for the programme is desirable, since the cost of such work might be of the order of £300,000. A successful outcome of the work could well attract the industrial capital required for subsequent underground development. Once again reference is made to the contribution the Eire Government has made to its own mineral development by its own attitude to exploration and taxation and Dr. Dunham says that the ultimate object of the U.K. scheme outlined could be "the production of non-ferrous ores worth £5,000,000 per annum."

This is, then, the proposal that the Council of the United Kingdom Metal Mining Association makes to the Government and it is to be hoped that it will bear fruit. The Geological Survey is naturally interested in such a programme, which can be described as an assessment of the country's mineral reserves. These, hidden, can add nothing to our wealth, but discovered, even if unexploited, they become an asset of increasing value as deposits overseas become exhausted. That the Government is interested is evidenced by the increasing attention the Survey is paying to aerial magnetic prospecting. Recently, it will be recalled, there was a survey of this kind over Cornwall and Devon and it is now announced that a further contract has been concluded with Canadian Aero Service, Ltd., of Ottawa, for an airborne magnetometer survey of areas in the northern United Kingdom. It will cover

7,000 square miles in Ireland, 10,000 square miles in Northern England and Southern Scotland, as well as some 3,000 square miles of adjacent areas of the Irish Sea. Flying is to begin in mid-June.

### Exploration for Bechuanaland

It was announced at the beginning of June that an agreement granting rights to prospect over an area of approximately 40,000 sq. miles of the Bamangwato Tribal Area in Bechuanaland had been signed by the Rhodesian Selection Trust group of companies and the African Authority for the tribe. The agreement, which was concluded with the knowledge and approval of H.M. Government, provides that Rhodesian Selection Trust Exploration, Ltd., after an agreed preliminary period of investigation, may form a company to be controlled by it which will have the right to prospect and explore over the area for a period of up to ten years. In the event of mineral discoveries of economic significance mining rights will be exercisable by such company or by mining companies formed by it. Any mining companies so formed would pay royalties to the Bamangwato Tribal Authority on a basis which has been agreed between the parties.

The Bamangwato Tribal Area, in the eastern part of Bechuanaland, skirts the Makarikari Salt Pan to the north and later joins the Southern Rhodesian border, along which it runs for a short distance. The border then turns southwards, passing to the west of Francistown, and then runs in an easterly direction to within a few miles of the Limpopo River and the frontier with Northern Transvaal; to the west is the Kalahari Desert. The greater part of the area, never before scientifically explored for minerals, is flat but there are several ranges of hills to the east. The main railway from Bulawayo to Mafeking runs for about 200 miles through the area and there are various stations on the route, the more important being Palapye and Mahalapye. After the signing ceremony it was announced that Rhodesian Selection Trust Exploration is to have as its associates in carrying out exploration operations Mond Nickel Exploration, Ltd., and Minerals Separation, Ltd., the participation of these two companies having the approval of the African Authority. Rhodesian Selection Trust Exploration is to

direct and control operations on behalf of an exploration company to be formed, in which it will hold the controlling interest.

### Non-Ferrous Metal Research

A new addition to the laboratories of the British Non-Ferrous Metals Research Association was opened last month by Sir Alexander Fleck, who unveiled a tablet engraved in titanium symbolizing the importance of the newer metals. The extension constitutes the third expansion of the building in Euston Street since the war and in addition to providing for new or expanded sections of the existing laboratories contains a council room and offices for the senior staff. The completion of the building and other re-arrangements and improvements effected will allow for future expansion in most sections and also provide more free space where equipment required perhaps for only a year or two for a particular project can be accommodated.

The Association since its establishment in London in 1930 has continually expanded, the number of subscribing member firms having risen from 250 to over 600, and exists to carry out research and to provide technical advice and information to producers, manufacturers, and users of non-ferrous metals. The programme is planned on the advice of the Research Board and six committees representing sections of the industry concerned respectively with aluminium and magnesium, copper and nickel, lead and tin, zinc and galvanizing, chemical and electro-chemical finishes, and the metallurgy of nuclear energy.

The organization of the research department is based on functions rather than materials and there are seven sections—melting and casting, general metallurgy, mechanical testing, corrosion, metal finishing, physics, and chemistry—each giving service to the others as necessary. This and a great deal more is fully explained in a booklet published recently to mark the occasion and to conclude this review it may suffice to refer to a note on the subject of nuclear power as an example of work in progress. Here it is explained that much of the work in connexion with metallurgical problems arising in the use of nuclear power comes within the general metallurgy section, although other sections, it is stated, are inevitably involved. For a study of alloys or dispersions based on thorium, for example,

which could provide an alternative fuel to uranium for future nuclear power stations, a special laboratory, also available for handling other weakly radioactive metals, has been equipped. Strength at high temperatures to resist the pressures exerted by the gases produced during fission is one important requirement in this work. Short-time high-temperature tensile tests are possible if the thorium is silver plated to prevent oxidation, but long-term creep tests are being carried out in an atmosphere of specially purified argon. The apparatus developed for this work is also used for creep tests on other reactive metals such as zirconium.

### Mining Machinery Exhibition

The exhibition of mining machinery which is being held at Olympia, London, from July 9 to 18 will be largely devoted to the equipment used in coal mining, as is to be expected since the project is promoted by the Council of Underground Machinery Manufacturers most of whose members are more particularly concerned with this branch of the industry. However, as will be evident from the notes elsewhere in this issue, there will be much to interest the metalliferous mining engineer and it is to be hoped that the exhibition's organizers will reap the reward of a good attendance, especially from overseas visitors.

That such a wide interest has in fact been created in advance is probably true because in addition to the exhibition itself there is the symposium on shaft sinking and tunnelling to be held in one of the conference halls at Olympia on July 15, 16, and 17, which has been arranged by the Institution of Mining Engineers. Here again while many of the papers to be discussed relate to colliery practice both in this country and in several overseas countries it is also a fact that a number of those to be presented relate to metal-mining practice, notably those from Canada and South Africa.

The purpose of the exhibition, as of the symposium, is to awaken interest in the contributions which the British manufacturer has made in the ten years which have elapsed since a similar display of plant and machinery was held in London to the advancement of underground mining techniques and it must surely be the wish of all concerned that it will not fail in this endeavour.



## MONTHLY REVIEW

**Introduction.**—There is, at the time of writing, a great deal of uncertainty as to the outcome of the meeting of Foreign Ministers in Geneva and a consequent wavering of business confidence, not well-sustained as it is by uneasiness in the United States regarding prospects of a steel strike. Base-metal prices show little change over the past month, since everything awaits acceleration of the recovery in industry.

**Transvaal.**—The gold output of the Rand and Orange Free State mines for April totalled 1,616,891 oz., making with 36,815 oz. from outside mines a total of 1,653,706 oz. for the month. At April 30 there were 383,710 Africans at work in the gold mines, as compared with 379,257 at the end of the previous month.

During 1958 BRAKPAN MINES milled 1,492,000 tons of ore and recovered 198,620 oz. of gold, the year's accounts showing a surplus of £229,158. SPRINGS MINES treated 1,500,000 tons, for 173,448 oz. and made a profit of £110,024.

The accounts of STILFONTEIN GOLD MINING for 1958 show a profit of £5,961,975 and £2,449,298 distributed as dividends equal to 3s. 9d. a share. In the year 1,399,000 tons of ore was crushed and 699,172 oz. of gold recovered, while the uranium plant produced 375,164 lb. of uranium oxide. The report says that work on extensions to the reduction plant to a nominal capacity of 160,000 tons per month was completed and the expanded plant commissioned during July last. In August the reef picking plant was commissioned and improved waste elimination has resulted in a higher figure of cost per ton milled, which has been offset by the improved recovery grade.

VLAKFONTEIN GOLD MINING reports a profit of £1,061,990 for 1958, dividends equal to 1s. 11d. a share absorbing £575,000. The 595,000 tons of ore milled in the year yielded 210,606 oz. of gold.

The report of VOGELSTRUISBULT GOLD MINING AREAS for 1958 shows a profit of £1,143,252, of which dividends totalling 2s. a share require £502,857. In the year 1,141,000 tons of ore was milled and 254,865 oz. of gold recovered, the uranium plant yielding 222,554 lb. of uranium oxide.

The operations of CITY DEEP during 1958 resulted in a profit of £186,853, the accounts showing that dividends equal to 1s. 1½d. a

share required £114,009. The company milled 1,511,000 tons of ore and recovered 300,102 oz. of gold.

Crushing 615,000 tons of ore in 1958 and recovering 86,152 oz. of gold ROSE DEEP made a profit of £76,714.

At the recent annual meeting of NIGEL GOLD MINING a special resolution was passed reducing the issued capital of the company from £215,890 7s. to £107,945 3s. 6d. After confirmation by the Court of the reduction a circular will be issued advising shareholders of the date on which the return of 1s. 6d. per share in cash will be made.

In his statement to shareholders in the report for 1958 the chairman of ROBINSON DEEP recalled that a year ago it was considered that in spite of the difficulties being experienced it should be possible to maintain operations for some time to come, provided working conditions remained normal. Unfortunately, he says, the severity of pressure bursts which have occurred only too frequently, particularly in the Turf shaft pillar area during the second half of 1958, have provided abnormal conditions, with the result that the tonnage milled when compared with the previous year dropped from 908,500 tons to 862,500 tons and although there was an increase of 0.102 dwt. per ton in the average yield this was insufficient to offset a rise in working costs of 3s. 7d. per ton milled. These factors resulted in the working profit of £16,855 being lower by £109,905.

In the three months to March 31 last DOMINION REEFS (KLERKSDORP) treated 130,600 tons of ore and produced 138,188 lb. of uranium oxide. The working profit for the period is given as £223,287.

At an extraordinary meeting of WITBANK COLLIERY held on May 15 in Johannesburg it was proposed that the capital be increased to £1,540,000 by the creation of 1,155,000 new £1 shares. These are to be issued as a bonus to existing holders, in the ratio of three new shares for every one held, financed by a capitalization from reserve.

RAND MINES reports a profit of £1,498,685 for 1958, the accounts showing £1,931,688 available, of which dividends totalling 5s. 9d. a share require £819,661. In the year the ore milled by the Central Mining-Rand Mines group's mines in 1958 declined by 710,396 tons to 15,251,000 tons and the production of gold

declined by 15,401 oz. to 3,478,296 oz. fine (excluding special declarations).

**Swaziland.**—In the report of the ANGLO AMERICAN CORPORATION for 1958 it is stated that good progress has been made with drilling, trenching, and pitting operations at Bomvu Ridge, near Mbabane, where a geological and metallurgical examination of an iron-ore deposit is being carried out by SWAZILAND IRON ORE DEVELOPMENT. Results thus far tend to confirm the existence of a considerable body of high-grade iron ore. It is expected that the present prospecting programme will be completed towards the end of the current year.

**Orange Free State.**—The accounts of GENERAL EXPLORATION ORANGE FREE STATE, LTD., for 1958 show that revenue for the year amounted to £34,242 and exceeded expenditure by £20,172, the previous adverse balance of £18,820 thus being converted into a credit balance of £1,352 at the end of the year.

**Belgian Congo.**—At the annual meeting of the UNION MINIERE DU HAUT-KATANGA the chairman said that during 1958 the company produced 235,586 metric tons of copper, a slightly lower figure than the 1957 production, deliveries amounting to 242,188 tons. The results permitted the distribution of a net dividend of 1,500 francs per share. He pointed out that this dividend represents a total net amount of Fr. 1,863,000,000 of which Fr. 316,000,000 will be paid to the Government of the Congo through the Comité Spécial du Katanga and Fr. 1,547,000,000 to the other shareholders. Taxes and duties for the year amount to Fr. 1,794,000,000 and the share of the Congo in the Comité Spécial royalty to Fr. 86,000,000.

**Northern Rhodesia.**—Last month the BRITISH SOUTH AFRICA COMPANY announced that its estimated gross revenue from mineral royalties, rents, and fees for the March quarter, after providing for the payment to the Northern Rhodesia Government of 20% of the net revenue derived from the exercise of its mineral rights in Northern Rhodesia, amounted to £2,500,000.

**Ghana.**—The operations of AMALGAMATED BANKET AREAS in the year ended September 30 last resulted in a profit of £162,640. In the year 739,760 tons of ore was milled and 172,754 oz. of gold recovered. The company's ore reserves are estimated to total 1,313,364 tons averaging 5.654 dwt. in value over 38.61 in. In his review accompanying the report and accounts the chairman states that the company has been able

to use the Government grant to good effect, the increased development programme making possible the increase in capacity and grade. To maintain this progress further assistance, he says, is needed and it is hoped that the Ghana Government's reaction to the report on the marginal gold mines in Ghana prepared by Dr. G. C. Monture in 1958 will be favourable and lead to legislation fixing a subsidy on gold production on the lines of present Canadian legislation.

At the annual meeting of ARISTON GOLD MINES (1929) held May 22 the chairman announced that an issue of further capital would be made as follows: Out of the remaining un-issued authorized capital of £375,000 in shares of 2s. 6d. each stockholders are to be provisionally allotted one share for every seven units held. The issue price will be at 3s. 3d. per share (a premium of 9d. per share) and the issue price will be payable in full on acceptance.

BREMANG GOLD DREDGING recently stated that the re-erection of the No. 3 dredge on the Offin River had been successfully completed and the dredge has now re-started digging operations.

**Nigeria.**—Amalgamation of UNITED TIN AREAS OF NIGERIA and RIBON VALLEY (NIGERIA) TINFIELDS is recommended in recent circulars to shareholders. It is also intended to introduce proposals for a re-organization of capital.

During 1958 the BISICHI TIN CO. (NIGERIA) mined 687.5 long tons of tin concentrates and 80.5 tons of columbite, operations resulting in a profit of £80,639. A dividend equal to 4½d. a share requires £44,676. At December 31 last the ore reserves were estimated as 13,102,400 cu. yd. of ground containing 2,715 tons of tin and 5,827 tons of columbite.

EX-LANDS NIGERIA reports a profit of £35,119 for 1958, a dividend equal to 15% requiring £25,612. The year's output of tin concentrates totalled 474 tons, the company's proved reserves at December 31 being estimated as 3,894 tons.

The KADUNA SYNDICATE's report for 1958 shows a profit of £10,938, dividends equal to 33½% requiring £9,500. The year's output of tin concentrates totalled 233½ tons.

**Australia.**—In his statement accompanying the report and accounts for 1958 the chairman of the CONSOLIDATED ZINC CORPORATION said that the group profit, before mining royalty and taxation, amounted to £2,728,191, as compared with £4,322,442 for 1957, a reduction of £1,594,251, which



was fully accounted for by the fall in the profit of the ZINC CORPORATION's mine at Broken Hill, New South Wales. In 1958 the Zinc Corporation treated a total of 659,268 tons of ore for a production of 79,098 tons of lead, 2,033,955 oz. of silver, and 115,348 tons of zinc concentrate, as compared with 767,069 tons of ore for a production of 90,820 tons of lead, 2,198,457 oz. of silver, and 139,684 tons of concentrate in 1957. The 1958 outputs represented reductions of approximately 13% of recoverable lead and 17½% of zinc concentrate. NEW BROKEN HILL CONSOLIDATED treated 527,122 tons of ore for a production of 57,049 tons of lead, 1,498,434 oz. of silver, and 119,103 tons of zinc concentrate, as compared with 721,241 tons of ore, for a production of 64,794 tons of lead, 1,704,892 oz. of silver, and 154,325 tons of zinc concentrate in 1957. Those results represented reductions of approximately 12% of recoverable lead and 23% of zinc concentrate. The grade of ore mined from the Zinc Corporation leases in 1958 was slightly higher, at 12·9% lead, 3·3 oz. silver, and 10·1% zinc, while, as a result of the curtailment of ore extraction in the low-grade zincy lodes and work having been increased in the richer lead lodes the grade of ore from New Broken Hill Consolidated leases was raised to 11·8% lead, 3·1 oz. silver, and 12·7% zinc in 1958.

In an interim report shareholders of the LAKE GEORGE MINING CORPORATION have been informed that five bore-holes of the deep-drilling programme, testing for continuation of the Keatings, Elliot's, and Elliot's Footwall ore-bodies at points 1,000 ft. below the 2,030-ft. level, have now been completed. Intersections of the lode shales were discouraging and the question of further deep drilling is under review.

It has been announced that deep diamond drilling on Hannans Lode (3 miles south of the Golden Mile) has been resumed. Special rigs are to be employed, with various modifications in order to obtain results to 7,000 ft.

**New Guinea.**—In the three months to February 28 last BULOLO GOLD DREDGING treated 917,305 cu. yd. of ground and recovered 4,274 oz. of gold. The net profit for the nine months to that date is estimated at \$325,000.

**Malaya.**—At an extraordinary meeting of SUNGEI BESI MINES to be held on June 11 it was to be proposed that the authorized capital be increased to £700,000 by the capitalization of £327,060 standing to the credit of reserve

accounts. If the recommendations are adopted shareholders will receive two new fully-paid shares for every one held.

The report of KILLINGHALL TIN for the year to September 30 last shows a profit of £7,475 and that of HONGKONG TIN, for the same period, one of £3,288. In the year Killinghall sold 288 tons of tin concentrates and Hongkong 269 tons.

**India.**—The CENTRAL PROVINCES MANGANESE ORE CO., LTD., reports a profit of £511,357 for 1958, the accounts showing £822,615 available. Dividends and a bonus equal to 3s. 2d. require £475,000 of this amount and after making other allowances a balance of £307,524 is carried forward.

**Colombia.**—The operations of PATO CONSOLIDATED GOLD DREDGING in 1958 resulted in a net profit of \$833,017, which compares with \$1,040,856 for the previous year. The reduction in profit below estimates was due to additional charges for exchange and dollar value adjustments of materials and supplies. During 1958 the company paid two dividends totalling 35 cents a share. During the year 22,100,000 cu. yd. of virgin gravels, transient sand, and tailings were handled by the dredges, the average grade of which was 19·43 cents per cu. yd. and the gross recovered value was \$4,293,145. The grade of the gravels treated during the year rose from 16·81 cents during 1957 to 19·43 cents during 1958. Total recovery increased by \$398,642 due to somewhat higher grade gravels dredged. There was a decline in the yardage treated of 1,065,000 cu. yd. chiefly due to a 102-day shutdown of No. 5 dredge for major reconstruction and modifications. The company's hydro-electric plants operated without major interruption throughout the year, generating 32,024,500 kWh of electrical power.

**Dominica.**—It has been announced that SAL Y YESO C. POR A. is completing a \$5,000,000 mechanization plan for its gypsum deposits near Barahona. These will consist of large-capacity conveyor-belts, road and railway and bulk loading installations, and piers at Barahona. The new transport system will come into operation in August and will employ three 22-ton Euclid conveyors and 40 railway wagons of 30 tons capacity. Loading installations for bulk gypsum shipments at the port of Barahona will have a capacity of 1,000 tons of gypsum an hour. Even at the faster rate of extraction there are stated to be reserves sufficient to last for many years.

**Canada.**—The report of the INTERNATIONAL NICKEL CO. OF CANADA, LTD. and subsidiaries for the three months ended March 31, shows net earnings in terms of United States currency of \$16,984,000.

**United Kingdom.**—At an extraordinary meeting of GEEVOR TIN MINES held on June 12 it was to be proposed that the company's capital should be reduced to £87,500 by paying off 4s. 6d. on each 5s. share. Thereafter the capital was to be increased to its former amount of £180,000 by the creation of 3,715,200 new 6d. shares, later to be consolidated into 5s. units. The company has been informed that a formal bid of 23s. 6d. per stock unit is to be made for the whole of the units comprising the issued capital of the company, subject to acceptance by holders of 90% of the stock units and to the abandonment of the proposed return of 4s. 6d. per unit. The directors have strongly advised against acceptance.

### DIVIDENDS DECLARED

\* Interim † Final  
(Less Tax unless otherwise stated.)

† Ampat Tin Dredging.—20%, payable July 1.  
\* Anglo American Corporation of South Africa.—  
Pref. 3%, Ord. 7s. 6d., payable Aug. 6.  
Anglo-Huronian.—Quarterly, 25 cents, payable July 23.  
† Bisichi Tin Co. (Nigeria).—4½d., payable June 25.  
† Bremang Gold Dredging.—7½%, payable July 10.  
\* Cam and Motor Gold Mining.—6d., payable Aug. 7.  
† Cape Asbestos.—12½%.  
\* Central Norseman Gold Corporation.—1s. 9d. (Aust.), payable June 26.  
\* Consolidated African Selection Trust.—15%, payable June 26.  
Consolidated Co., Bultfontein Mine.—Half-yearly, 7d., payable July 28.  
\* Coronation Syndicate.—3d., payable July 31.  
\* Dominion Reefs (Klerksdorp).—1s. 6d., payable Aug. 4.  
† East Rand Consolidated.—2d., payable July 22.  
† Ex-Lands Nigeria.—15%, payable June 25.  
\* Goodlass Wall and Lead Industries.—11%, payable July 15.  
Griqualand West Diamond Mining.—Half-yearly 2s. 10d., payable July 28.  
† Idris Hydraulic Tin.—2d. and 3d. bonus, payable July 9.  
† Kaduna Prospectors.—4d. payable July 6.  
† Kaduna Syndicate.—2d., payable July 6.  
† Kuala Kampar Tin Fields.—40%, payable July 10.  
† Minerals Separation.—1s., payable July 1.  
\* Mufulira Copper Mines.—1s. 9d., payable July 1.  
New Jagersfontein Mining and Exploration.—  
Half-yearly, 6d., payable July 28.  
\* Orange Free State Investment Trust.—2s., payable Aug. 6.

**African and European Investment.**—The accounts of the African and European Investment Company for 1958 show a profit of £1,630,421 and £1,805,597 available, of which dividends, equal to 4s. per ordinary unit, require £941,000.

**General Mining and Finance Corporation.**—The report of the General Mining and Finance Corporation for 1958 shows a profit of £1,726,825. Dividends, equal to 6s. on the ordinary shares, require £911,760.

**Minerals Separation.**—With the recent dividend notice shareholders of Minerals Separation have been informed of the directors intention to capitalize £750,000 from premium on shares account and investment reserve account and to issue 3,000,000 new shares of 5s. each credited as fully paid. The issue will comprise three new shares for every five ordinary stock units held. If these proposals are carried through the issued capital of the company will be £2,000,000.

\* Peel River Land and Mineral.—5%, payable July 1.  
Powell Duffryn.—Pref. 2½%, payable July 1.  
\* Rand Selection Corporation.—1s., payable July 17.  
Rhodesia Copper Refineries.—Pref. 2½%, payable June 29.  
\* Rhodesian Selection Trust.—4d., payable July 1.  
Rhokana Corporation.—Pref. 2½%, payable June 29.  
\* Roan Antelope Copper Mines.—3d., payable July 4.  
† Selection Trust.—5s. 3d., payable Aug. 8.  
† Siamese Tin Syndicate.—3d., payable July 10.  
\* Stewarts and Lloyds.—3%, payable July 16.  
\* Turner and Newall.—5%, payable July 18.  
\* Tweefontein United Collieries.—4½d., payable July 1.  
\* West Rand Investment Trust.—1s. 3d., payable Aug. 6.

### METAL PRICES

June 9,

Aluminium, Antimony, and Nickel per long ton ;  
Chromium per lb. ; Platinum per standard oz. ;  
Gold and Silver per fine oz. ; Wolfram per unit.

	£	s.	d.
Aluminium (Home).....	180	0	0
Antimony (Eng. 99%).....	190	0	0
Chromium (98-99%).....	7	2	
Nickel (Home).....	600	0	0
Platinum (Refined).....	28	10	0
Silver.....	6	6½	
Gold.....	12	9	9½
Wolfram (U.K.).....	—		
(World).....	5	1	0

Tin  
Copper } See Table, p. 364.  
Lead  
Zinc }

# Vanadium

## in Industry

M. Schofield, M.A., B.Sc., F.R.I.C.

The author discusses

a wide range of

recent developments.

Within recent years developments in the atomic field have changed completely the idea that vanadium metal, as distinct from its alloys and the vanadium steels, finds no industrial application. An example is the production by the Birmingham firm of Accles and Pollock of vanadium tubes produced to fine tolerances as sheaths for fuel elements in the Dounreay fast fission reactor. The metallurgist is thus called upon to revise previous concepts by producing "massive vanadium" in pure, ductile form rather than everyday ferrovanadium for the steel industry which came into prominence 50 years ago.

The rise of vanadium and of its oxide as catalysts of supreme industrial importance has proved as striking as was the discovery of rich vanadium ores 16,000 ft. up in the Andes by the prospector Riza Patron. It was a professor in the School of Mines at Mexico City who began vanadium history when, in a brown lead ore (now known as vanadinite) from Zimapan, he discovered a new element which he called "erythronium." Del Rio lacked faith in his analyses, however, deciding that the suspected new element, even though it formed red compounds on heating, was only chromium. He left it to Sefström, director of the School of Mines at Fahlun, in Sweden, to find a new element in a sample of iron from the Taberg mine and to prepare solutions of the salts of vanadium from the scoria left in converting his cast iron to malleable iron. Sefström was thus fortunate, since Wöhler was able to prove that erythronium and vanadium were the same element; yet he too found vanadium elusive and was handicapped by the loss of a main extraction when one of his research students spilled the batch.

From Mexico City and Sweden the development of vanadium chemistry switched surprisingly to Britain, when Henry Roscoe, professor at Manchester, took up the story in the 1860's. Roscoe had the rare distinction for an English professor of having his name perpetuated in a silicate and aluminate of

vanadium now called "roscoelite," a mica found as vein mineral in some gold-bearing veins and also in quantity in Utah and Colorado sandstones. In Roscoe's time the vanadium salts he obtained so laboriously (from an Alderley Edge copper vein, in the Lower Keuper sandstone) sold at £35 an oz., this when the free metal was yet to be extracted. By 1869 Roscoe, assisted by Edward Thorpe, won the first silver-white powder of metallic vanadium by heating the chloride in platinum boats within a porcelain tube, using hydrogen as reducing agent. Roscoe deserved full credit for this production of vanadium metal and for preparing so many vanadium compounds while starting with a mineral containing only 2% of the element.

Moissan, in his electric furnace, failed to prepare the metal by reduction of an oxide and other workers also failed to produce the pure metal by application of Goldschmidt's aluminothermic process; hence it was not until well into the 1920's, with sodium and calcium reduction well developed, that pure vanadium metal was produced as an extension of Roscoe's pioneering efforts. In 1923, Hunter and Jones reverted to Roscoe's use of vanadium chloride as starting material, but adopted sodium in a steel bomb for reducing the chloride to a fine grey powder of over 99.5% purity. Then, in 1927, J. W. Marden and M. N. Rich, of the research staff of the Westinghouse Lamp Company, produced vanadium powder or shot of up to 99.8% purity by heating in a steel bomb at 950° C. a mixture of vanadium pentoxide, calcium metal, and calcium chloride, the resulting mass being cooled and extracted with water to leave the pure metal.

Before coming to modern developments in producing pure vanadium metal on a large scale the extensive work on industrial applications of alloys and the oxide as catalysts should be summarized, since it was these which sent prospectors scouring the world for vanadium minerals. At the end of the last century France claimed a share in

vanadium developments, when such metallurgists as Choubley, H  louis, and Guillet made researches on vanadium present in fair quantities in the slags from the Schneider works at Creusot. In 1896 armour plates produced at the Firminy steelworks which included vanadium were shown to be much tougher than the normal types then in use, while four years later Professor Arnold, of Sheffield, made a second British contribution when he studied the effects of vanadium inclusions on ordinary carbon steels at a time when engineering industries were demanding tougher steels for automobiles and other outlets. Vanadium additions were subsequently found to make steel fine-grained and more homogeneous by dispersing impurities. As ferro-vanadium the element acts as a scavenger for oxygen and non-metallic impurities, less than 1% being sufficient to impart such beneficial effects that before the change-over came some 95% of the world's vanadium went into alloy steels, high-speed steels, steels for locomotive and automobile forgings, gears, axles, springs, transmission shafts, and for rock-crushers, heavy-duty machinery, dredges, and armour-plate and shells. Molybdenum-vanadium steels with or without chromium have given great strength and low hardness to cast iron, while vanadium also became adopted in certain brasses and bronzes and in aluminium alloys.

All such metallurgical applications developed long before the present accent on "massive" vanadium, used as pure metal in engineering, brought into prominence the question of improved ore supplies.

Vanadium is widely disseminated in the earth's crust though only economically mined as patronite, roscoelite, carnotite, and vanadinite. The discovery of the first provided a classic story for textbooks, this when Riza Patron in 1905 found at 16,000 ft. altitude in the Peruvian Andes an impure vanadium sulphide averaging 40% of  $VS_3$ . With the ore brought down on the backs of llamas until the Vanadium Corporation built a narrow-gauge railway in 1921, this mining of patronite not only provided a major world supply for some years but brought much publicity to vanadium and to Patron.

Patronite, at times represented by  $VS_3$  and on other occasions as  $V_2S_5$  plus free sulphur with some hydrocarbons, includes also some nickel, iron, and molybdenum. It is roasted, the mass then leached, and a vanadium oxide

concentrate precipitated. A common process is to roast with common salt to convert the vanadium to sodium vanadate which is water-soluble. Leaching with dilute acid follows before adding the main bulk of sulphuric acid to bring down  $V_2O_5$ . Purification of this oxide becomes important when massive pure vanadium rather than ferro-vanadium is the product required. The oxide is dissolved in caustic soda and ammonium chloride added to precipitate the element as ammonium vanadate of high quality, an intermediate which on calcining evolves ammonia and water vapour to leave a highly pure vanadium oxide for subsequent treatment.

The great stability of vanadium monoxide in the metal proved a bane to earlier workers reducing vanadium concentrate to metal, Moissan for example preparing an impure sample in his electric furnace. For production of ordinary grades of vanadium and for alloying, the aluminothermic process was at first the only one successful. Then came a process devised by B. D. Saklatwalla, of the Vanadium Corporation, in which an electric furnace ensured the direct reduction of vanadium oxide with carbon occurring so rapidly that the tendency to form a lower oxide was eliminated. As with the Canadian technique for reducing magnesium oxide, an alternative to carbon as reducing agent became introduced to vanadium metallurgy when silicon proved successful, the Duplex electric furnace reduction of vanadium oxide from carnotite adopting this alternative.

To mention carnotite brings a reminder of the successful search for vanadium supplies elsewhere than at Mina Ragra, in Peru, a search which became intensified when vanadium entered the military field. From Colorado, Utah, and Arizona came carnotite, a potassium uranyl vanadate from the uranium-bearing sandstones in those areas, the vanadium being separated by dissolving both uranium and vanadium, precipitating the uranium with caustic soda, and then bringing down vanadium as calcium vanadate which is readily converted to vanadium pentoxide. There are also sources of vanadinite in the metallic veins of Mexico and Arizona and roscoelite from Utah and Colorado, while further sources in the West are rock phosphates of Idaho and Montana which yield vanadium oxide on processing the phosphates with sulphuric acid for production of superphosphate and free phosphoric acid. At Otavi, in South-West Africa, and in



northern Rhodesia are further sources, the descloizite of Rhodesia being a lead-zinc vanadate associated with lead minerals.

Vanadium oxide as by-product in the production of titanium oxide from ilmenite and small supplies of vanadium oxide from the ashes and soot removed from boilers and smoke stacks of vessels burning Venezuelan and Mexican fuel-oil and from similar sources in Italy; these are examples of the wide occurrence of an element on a par with zinc or nickel as regards available resources. The ashes of bitumens, asphalts, petroleum, and coals may yield up to 12% vanadium. When the fuel value of such raw materials can be used economically, processing for vanadium recovery becomes a practical proposition.

Turning now to modern extraction processes for yielding pure vanadium in massive ductile form, the calcium reduction method of Marden and Rich already referred to was improved by E. D. Gregory in 1951 by using vanadium trioxide as starting material instead of the pentoxide, this resulting in better control of temperatures to round about 1,900° C. or just above the melting point of the metal. Gregory's process still used calcium metal as reducing agent, but in excess and with one molecular proportion of calcium chloride, the whole being in an argon atmosphere. This yielded vanadium powder of 99.8% purity, with calcium, carbon, oxygen, and nitrogen as impurities within defined limits. After leaching out the calcium chloride and oxide, the vanadium is worked to ductile sheet, rod, and wire in a vacuum sintering furnace followed by powder metallurgy as in the case of tungsten, tantalum, and similar metals.

In 1950, in the *Journal* of the Electrochemical Society, R. K. McKechnie and A. U. Seybolt described their improvement on Marden and Rich's process by including iodine in the charge. This in combining with the calcium releases energy to start the reduction process, while the calcium iodide formed is preferable to using calcium chloride as the metal can be obtained as a solid regulus. The Vanadium Corporation used this calcium iodide alternative with success to give from each bomb charge up to 15 lb. regulus of vanadium of 99.8% purity. The process is distinct from Van Arkel's "iodide" process in which vanadium iodide is decomposed on contact with an electrically-heated filament, a technique used with success in producing titanium of high purity.

Although this process has been worked on a small scale in industry, it is more suitable for producing standards of high purity and is uneconomic for vanadium.

More successful is a type of calcium plus calcium iodide reduction process worked by the Electro-metallurgical Division of the Union Carbide and Carbon Corporation, the resulting vanadium being converted into ductile metal by feeding vanadium chips into an electric arc in an atmosphere of argon or other inert gas, the metal being then cast in water-cooled copper moulds. Such an arc process produces crystalline vanadium, a massive form which can be hot-worked with or without protective sheaths or cans when an inert atmosphere is maintained.

All such emphasis on the production of massive vanadium illustrates the recognition of this metal in other fields than in alloying or as target metal in X-ray tubes. Its use as an alternative to columbium (or niobium) in sheaths for fuel elements in the atomic field will be followed by other engineering applications of the pure metal, now that efficient extraction processes have been worked out. One other direction in which vanadium is in considerable demand is as pentoxide in catalysts. Supported on pumice, alumina, or other inert body, the oxide proved of great value as alternative to platinum catalysts in the manufacture of sulphuric acid by the contact process, the vanadium oxide not being susceptible to poisoning by traces of arsenic as is the case with platinum. Even more versatile is vanadium oxide in the production of organic intermediates by oxidation of compounds in the vapour phase with air, vanadium oxide being almost as useful a catalyst as is nickel in hydrogenations.

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### International Sulphur Institute

Last month the Rio Tinto Company announced that a meeting held in Paris on May 22, and attended by producers of pyrites and sulphur, was convened with the object of forming a non-profit making International Sulphur Institute. It was agreed, it is stated, to proceed with the formation of such an Institute with the object of discovering new uses and extending the application of existing uses of sulphur in all forms throughout the world. It will be some time, however, before the constitution and membership can be finally established.

# Billingham

## Mine To-day

A note on  
a recent visit  
to this well-known  
anhydrite producer.

Mining operations at the Billingham anhydrite mine have been well described in the literature. On the occasion of a visit to the mine by members of the Institution of Mining and Metallurgy in 1946 the history of the property and the general geology were outlined by the manager, Mr. Stewart,<sup>1</sup> who went on to describe the mining methods employed. In the following year the development of trackless mining was envisaged and progress to the end of 1953 was subsequently made clear.<sup>2</sup> The notes on the mine given here were obtained during a recent visit to Billingham to inspect the new concentrated chemical fertilizer (C.C.F.) plant, claimed to be the largest granular-fertilizer plant in Great Britain and one of the largest of its kind in the world.

The anhydrite mined at Billingham is found as a hard seam varying in thickness

<sup>1</sup> STEWART, G. Eland. Billingham Mine. *Trans. Instn. Min. Metall.*, Vol. 56, 1946-47.

<sup>2</sup> *Mine, Quarry Engg.*, Dec., 1953; Jan., Feb., 1954.

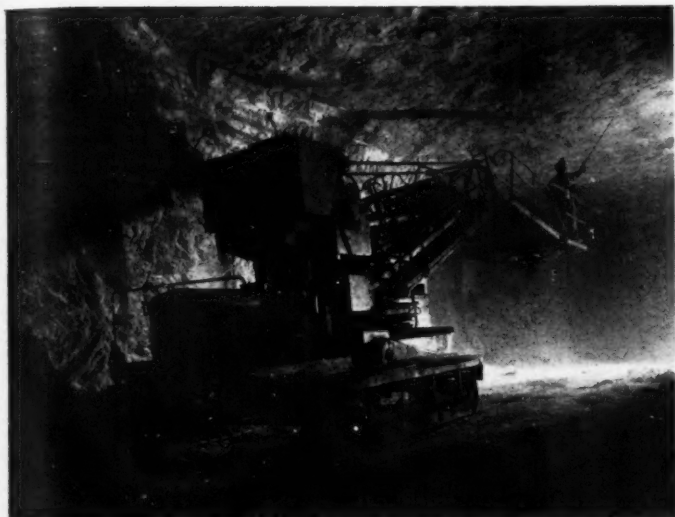
from 13 ft. to 18 ft. and at inclinations from the flat to one in four. The mineral is used as a source of sulphur in processes manufacturing sulphate of ammonia and sulphuric acid. The expanding demand for anhydrite raised a number of problems, the most imperative of which was to devise methods of obtaining the mineral efficiently from working faces at ever increasing distances from the mine shafts without absorbing too many men on the unproductive work of underground transport. To this end the first three half-track stone-haulage trucks were delivered in 1947 to the mine from the United States and they were followed by a Joy stone loader. This was the nucleus of a plan to modernize the whole system of mining and was expected to cost some £750,000.

From 1928 the mine had operated very much on coal-mining practice, with 25-cwt. capacity tubs running on 30-in. gauge tracks, drawn by 75-h.p. electric trolley locomotives. The first trackless mining equipment supplied had thus to operate where there were no

Electric  
Rotary  
Drilling.







**Roof  
Sealing.**

made-up roads; the first half-track trucks, fitted with bulldozer blades, had in fact to make roads for themselves, fanning out from the mine shafts to the working faces. However, 12 years of modernizing have given a complete "face-lift" to the mine which now has over 3,000 h.p. of diesel vehicles of various kinds underground. A short walk from the shaft bottom takes the miner to the buses which take them to the face.

Drilling at Billingham is still mainly by compressed-air percussive drills, although

much thought and capital are being expended on the development of a practical system of dust-free drilling. Anhydrite has to be mined dry and, with a dust like Plaster of Paris, filtering and collection of this in fine form are most difficult. One of the rotary drill rigs that have been developed is shown in an accompanying illustration. This unit uses auger steels with tungsten-carbide bits and produces such coarse chips that most of them fall directly to the floor, leaving the atmosphere practically free from dust.



**Loader  
at Work.**

Penetration is at the rate of 15 in. per minute and one driller operating the twin-boom prototype rig should be able to drill well in excess of 500 ft. per shift.

The modernization programme has raised the output of the mine to over 23,000 tons a week, with only 80 miners working on each of the three producing shifts per day.

## Cerro de Mercado, Mexico

M. S. Albans

### Introduction

Some 35 years after Cortez conquered Mexico (1519-21) one of his captains, Vazquez de Mercado, planted a cross on the highest point of a mountain of iron situated a mile from an Indian town. That town now is colonial-styled Durango, capital of the state of Durango, in central Mexico. Indian tales of a gigantic mound of silver had lured Mercado to take a 400-mile trip over mountains and through deserts to Durango from the plundered Aztec stronghold of Mexico City. He was grievously disappointed. Less than a decade later, however, Indians under Spanish masters were digging out Durango's

iron ore with pickaxes and conveying it on burros to a crude hand smelter.

More than four centuries passed before these methods changed appreciably. In 1920, as its need for iron ore began to increase, the Monterrey Iron and Steel Co. purchased the property and production began in 1934 under the name of Cerro de Mercado, S.A., the output being about 100 tons a day. Equipment included an Ingersoll-Rand compressor, rock-drills, and handcars, but with the installation in 1936 of two Allis-Chalmers Superior McCully crushers and an aerial ropeway production increased to 600 tons per day.

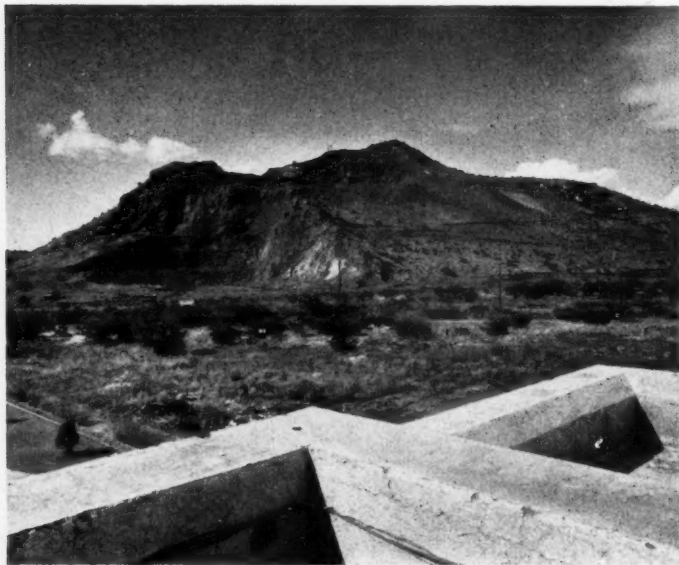
Two years ago large blast-hole drills,

Modern methods

installed in this iron

mine initiated a

high rate of output.



Iron  
Mountain,  
Durango.

power  
obtain  
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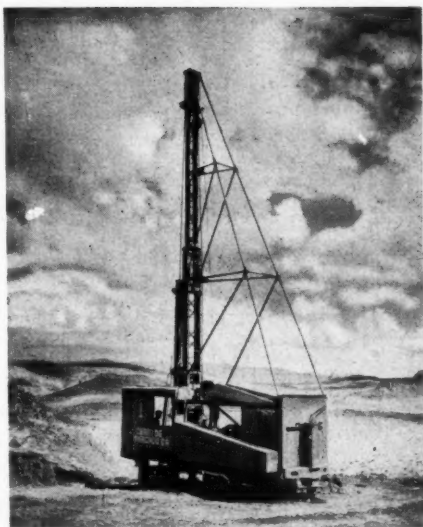


power shovels, and dump trucks were obtained for the mine and mechanized crushing, conveying, and loading operations began about a year ago. Two Bucyrus-Erie 50-T blast-hole drills, one working on a bench 60 ft. above the other, churn holes to a depth of 67 ft. The holes are 18 ft. apart and 18 ft. from the edge of the bench and eventually the mountain will be ribbed with 13 benches, each 60 ft. high. Between 18 and 20 holes are shot at one time with DuPont dynamite, such blasts yielding about 65,000 tons of material. Secondary breakage is handled by Ingersoll-Rand jackhammers powered by a stationary Joy-Sullivan compressor.

### Equipment

Three 2½-yd. Manitowoc 3,500 shovels load ore to 25-ton Euclid end dump trucks, while a Caterpillar D8 tractor pushes recently blasted rock into better position for shovel loading; a second clears overburden on the shelf above. A Traxcavator, which usually works on stockpiles below the conveyor system, sometimes helps load Euclids on the benches. The loaded trucks hurry around the side of the mountain to dump their loads into the grizzly leading to the Allis-Chalmers gyratory crusher, below which is an Allis-Chalmers Hydrocone gyratory crusher.

Ore is reduced to sizes ranging from 4 in. to 6 in. down to fine mesh and is fed to 30-in.



### Churn Drilling.

Goodrich rubber belts, installed in the Joy conveyor system, which uses Falk speed reducers. Four Allis-Chalmers screens classify the material, the oversize falling through a chute into stockpiles far below. The screened material passes on to the next chute for classification. A 400-ft. long and 9-ft. wide tunnel lies underneath the stockpiles. Inside



### Conveyors Over The Stockpiles.

the tunnel is a belt which, as it leaves the last stockpile, ascends 45 ft. into the loading plant.

### Pushbutton System

Pushbutton-controlled openings beneath the stockpiles feed into a loading shelf inside the tunnel. A Link-Belt rotary plough, also pushbutton-controlled, lifts ore from the loading shelf to carrying belts. Link-Belt also supplied the two apron feeders. The outstanding feature of this system is its flexibility. Any size ore can be loaded by pushing a button. The man at the controls in a cabin below the primary crusher follows telephonic instructions as to the amount and sizes of ore needed.

The system moves 675 tons of material in an hour. Four minutes after being dumped at the grizzly by the Euclids ore can be loaded into gondolas which run beneath the loading bins. The gondolas are manipulated by a Joy car puller. A Plymouth locomotive, with a Caterpillar 326 motor, pulls the cars a few

thousand feet to a main railroad line, from where they are dispatched to Monterrey, Monclova, or the United States.

A short distance from the loading station are the offices and repair shops. To combat the highly-abrasive iron ore Esco shovel dippers are manganese-steel-lined. Manganese-steel also is used in the grizzly and on strategic parts of the apron feeders. It is now planned to build a sintering plant at a cost of about \$1,000,000.

On the east side of the Iron Mountain a small company, Minera del Norte, S.A., is excavating ore from a small section with a Caterpillar Traxcavator, while another company is working a mile away on the other side of the Durango-Torreon highway. Its properties extend along a strip which covers about 120 acres.

Iron Mountain is Durango's big tourist attraction. Just as in the days of Captain Mercado, a cross is always kept atop the 500-ft. peak.

## Mining Machinery Exhibition

A preview of some

of the exhibits planned

for next month's show

As readers will be aware an exhibition of mining machinery promoted by the Council of Underground Machinery Manufacturers is taking place at Olympia, London, from July 9 to 18. Particulars of their proposed exhibits have been announced in advance by a number of those taking part and in the following notes items likely to interest the visitor are grouped under sections which it is hoped will make for easy reference. A further review will appear in the July issue.

### Roof Control

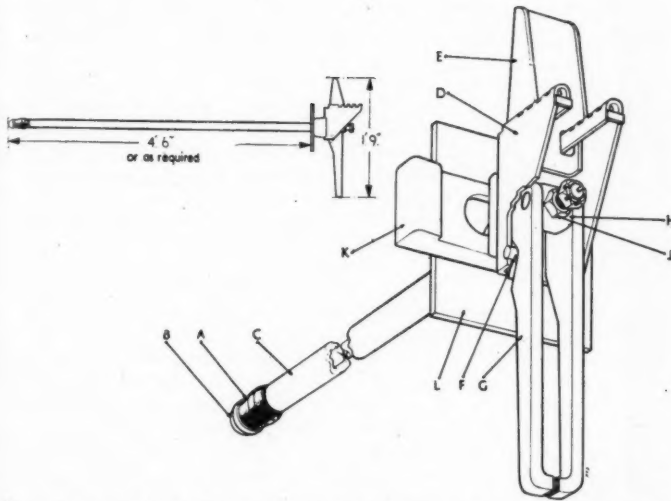
A number of companies will be showing recent developments in roof control. On the stand of **Dowty Mining Equipment, Ltd.**, for example, will be seen the Duke prop, the 50-ton chock, and the recoverable strata bolt. The prop is a 20-ton hydraulic unit with integral carrying handle and provision for free extension. The chock can be set at an initial

load of 5 tons and accepts to 50 tons before yielding, thereafter maintaining 50 tons' resistance. The diagram shows the construction of the strata bolt. The synthetic-rubber gripping head expands as the bolt is tightened to make close contact with the walls of the hole. It is recoverable in all conditions, including high loads, by pulling on the handle with a chain or rope from a safe distance, or if necessary with a Sylvester or other pulling device. A 10-ft. hydraulic prop which is an adaptation of the Duke design specially developed for Japanese mines will also be exhibited.

Another type of roof support is to be seen on the stand of **A. G. Wild and Co., Ltd.** This is the self-advancing Desford chock, of which two units are to be demonstrated. Both have been developed and proved in service underground. The Gull Wing type consists of two 50-ton chocks and a double-acting ram

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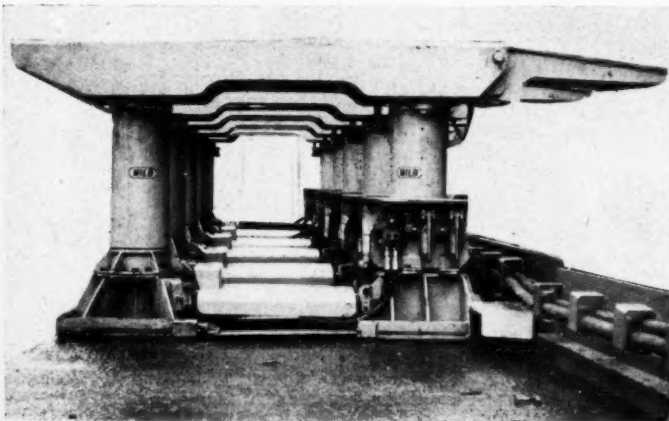
**Dowty  
Strata  
Bolt.**

A, synthetic rubber bush; B, collar; C, tube containing rod; D, bracket double-welded to end of tube; E, timber support carried on end of bracket; F, pins to secure handle and prevent recompression of gripping head during withdrawal; G, handle; H, trunnion against which nut is tightened; J, nut tightened to compress gripping head; K, setting wedge; L, patch plate driven by wedge against rock face to pre-stress the bolt.

which operates between them, advancing each chock separately so that the roof remains fully supported at all times. Each chock carries a double box-section roof bar and additional support is given by the roof bars operated by the hydraulic system on the front chock. The Goal Post type illustrated here consists of two 50-ton chocks operating as one unit under a common roof bar capable of withstanding a load of 100 tons at any point and an hydraulically-operated articulated extension over the conveyor. The unit

has an area of contact with the roof of 10 sq. ft.

A stand which will be exclusively devoted to props is that of **Aerow (Engineers), Ltd.**, on which will be seen a range of the available sizes of their hydraulic unit, which is illustrated. A feature of this is it is possible with it to produce an overall height of prop by an extension at either the top or the bottom. The hydraulic extension is available in seven different stages from 12 in. to 30 in. in increments of 3 in. The pump handle is



**Goal Post  
Type Desford  
Chocks.**





inserted in the most convenient position and moved backwards and forwards. This will cause hydraulic fluid to be transferred from the reservoir to both low- and high-pressure pump chambers and from these two chambers

into the main chamber, causing the prop to rise approximately 1 in. per stroke. This will continue until the head of the prop meets resistance, upon which the low-pressure valve in the low-pressure piston will lift, allowing the fluid in the low-pressure pump chamber to flow back into the reservoir. Only the fluid in the high-pressure pump chamber is now transferred to the main chamber, which means that the prop can be raised only a very small distance per stroke but with proportional increase in pressure. With normal manual effort a setting load of 12 tons to 15 tons can be obtained; with greater effort 20 tons can be obtained. The prop is now ready for its support duty. If the pressure of the roof on the prop exceeds the pre-set load of the yield valve (usually about 20 tons) the latter will open, allowing the prop to give way very slightly. The yield valve will close as soon as the pressure has dropped below 20 tons, normally at about  $19\frac{1}{2}$  tons. The prop will now hold until the yield load is again exceeded.

The Huwood T.C.R. prop, a line of which is shown in the photograph, is one which is being used in metal mines. The exhibit gives an example of all the various types at present being used in the British coalfields and shows the various types of heads available for different applications and also the various bases which have been found to be most suitable for the different types of floor conditions met with underground. To demonstrate the prop a powered prop-testing

**Huwood  
T.C.R. Props.**





machine is installed and on this is demonstrated the horizontal yield/load characteristic of the prop and the high load capacity of which it is capable. A special part of this exhibit is allocated to a new development, the T.C.R. chock. These will be seen on the stand of **Hugh Wood and Co., Ltd.**

Roof bolting is a subject which a company who have for many years been specialists in fixing devices for domestic and industrial purposes have made a particular study and they will be showing examples of their products. This is the **Rawlplug Co., Ltd.**, whose Rawlbolt is offered in three types—the RB  $\frac{3}{4}$  in. for use with  $\frac{3}{4}$  in. B.S.W. studs, the RB 1 in. (1 in. B.S.W. studs), and the S.E.  $\frac{3}{4}$  in. ( $\frac{3}{4}$  in. B.S.W. studs). The following features are emphasized by the makers: Shields and studs can be placed and hand tightened at the desired depth prior to assembly of plates or beams, etc. No setting tools are required. Can be finally tightened with an impact wrench, nut runner, or manually, using keys or torque spanners. The units are recoverable. The anchoring units consist of four segments made in malleable iron. The segments are tapered internally and are expanded by a suitably-tapered nut which is mechanically drawn into the shield when the stud is tightened, thus forcing the castings against the walls of the hole and giving an instantaneous anchorage. Extraction is possible by using an extractor tool. The S.E. shield is made up of two suitably-shaped malleable-iron castings held together by a steel stirrup, a threaded taper nut provided with two longitudinal slots in which the stirrup registers. The shields externally are formed with a buttress-type thread. This gives an initial grip when the stud is screwed through the nut on to the end of the stirrup. Like the R.B. units the S.E. type can be anchored at any depth of the hole. The shell will not turn while being tightened.

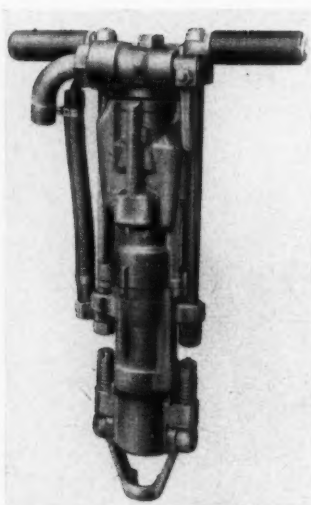
### Rock Drilling and Tools

Recent developments in rock-drilling equipment will be evident in the exhibits by several companies. It may be recalled that a description of a new drilling-platform elevator was given in a note in the *MAGAZINE* for February and in an article in the April issue, which also gave an account of a demonstration at a Derbyshire quarry. This novel machine, which consists of a steel platform driven by compressed-air motor to climb a rack-equipped guide rail, will be shown by **A.C.E. Machinery, Ltd.**

Shown for the first time in the United Kingdom is the **Bison**—a new rock-drill for long-hole drilling in mines—such as, degassing and methane drainage. It is a  $4\frac{1}{2}$ -in. drifter, designed for use in conjunction with a wagon drill or screw feed underground. An important design feature is that rotation can be reversed or completely cut off, keeping only the striking mechanism in action. This is on the stand of **Atlas Copco (Great Britain), Ltd.**, on which will also be seen the **Tiger** rock-drill designed for high-speed driving and stopping operations. The automatic back-head design prevents dry collaring. The drill is provided with "constant blowing," so that as soon as the pressure is turned on air blows through the machine to prevent water and dirt from entering through the rotation chuck. It will be mounted on a retractable leg connected to the rock-drill by a spring-loaded swivel elbow and the piston rod extends from the bottom of the feed leg, preventing sludge from entering the cylinder. Other equipment being shown includes a pusher-leg-mounted rotary coal drill, roof bolter, Coromant integral drill steels, Coromant extension equipment, and detachable bits.

The exhibits to be shown on the stand of the **Consolidated Pneumatic Tool Co., Ltd.**, will be grouped into sections each dealing with a specific aspect of mining or types of tools for specified duties. Thus a part of the display will be devoted to rock drilling, roof bolting, and face- and stope-operation. A new unit to be included is the latest addition to their range of oil-cooled rotary "Power Vane" air-compressors—a machine of 160 c.f.m. capacity which will be exhibited fitted with Teddington protection equipment. The "Tornado" 503 fast tunnel drill introduced last year will be shown mounted on a new lightweight feedleg. This drill will also be seen mounted for dry drilling with the Hemborn dust extractor. A CP 55 diamond drill with core barrel and specimens of crown bits will be included in the tool section.

Rock-drilling equipment will feature prominently on the stand of **Holman Bros., Ltd.**, who will be showing for the first time a new hand-held drill, as illustrated here. Known as the H.C. 300 it is suitable for shaft sinking and general heavy work where extra power is required and can be supplied for wet or dry drilling. It incorporates the company's standard throttle arrangement giving positive blowing for deep-hole drilling. The drill has a 3-in. bore and  $2\frac{1}{2}$ -in. stroke with a  $4\frac{1}{2}$  in. by 1 in. hexagonal chuck. It has an



overall length, less retainer, of 23 in. and weighs 78 lb. Many other drills will be shown, including the Silver Three. The Dryductor system will also be noticed, together with collectors and sampling units. Other drilling items are airlegs and stoper legs, a crawler mounted hydraulic drillrig, a pneumatic drill steel extractor, and tungsten carbide tipped drill steels and bits.

A wide range of stationary compressors is also to be exhibited providing capacities of up to 535 c.f.m. at 100 p.s.i., including those suitable for underground installation. These are fitted with instruments located on protective control panels to safeguard the units in the event of temperature rise, water or oil circuit defects, etc. A newly designed combined after cooler and anti-surge tank will also be shown.

Diamond-drilling equipment is not so much in evidence, but included in the stand of **Joy-Sullivan, Ltd.**, which is mainly devoted to other products, will be found an example of their skid-mounted drill. The drill is mounted on a rigid sub-frame which also carries the driving engine and the complete hydraulic system. The sub-frame is on a sliding base which provides a retraction of 6 in. from the drilling position. This feature means that large-diameter core barrels can be used and it allows for the insertion of casing in the large-series range. A hydraulic ram controls the retraction, but the hydraulic system is interlocked in such a way that retraction cannot take place during drilling. The 12-B drill

has a built-in closed-circuit pressure oil-circulating system, with chain-driven heavy-duty oil pump, hand-operated control valve, and pressure gauge. Diesel, petrol, electric, or compressed-air motors may be fitted. Two models are available—a heavy-duty type weighing 3,400 lb. or light-duty model weighing 1,610 lb.

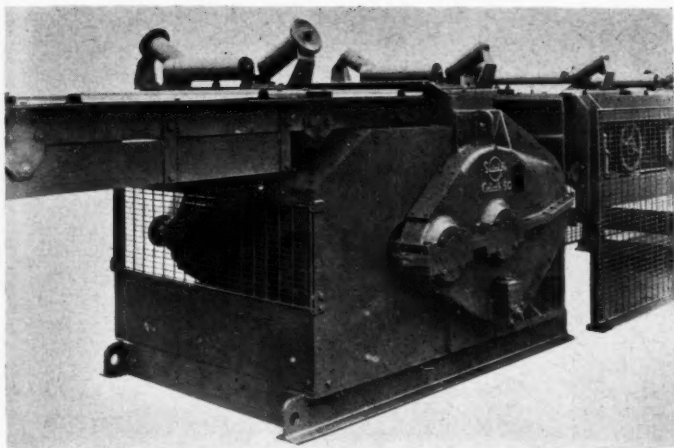
The Spearhead drill-stem adaptor bit, which has been designed to continue the useful life of tipped steels when the bit end is beyond regrinding, is of particular interest in the range of percussive-drilling equipment shown by **Padley and Venables, Ltd.** The makers point out that, as the carbide inserts are small and sufficient to outlast the remaining "fatigue" life in the average rod, there is no wasted carbide. The single-chisel design enables the bit to be ground without removing it from the rod, using the same grinding equipment as for integral-tipped steels. Some interesting test figures gained from work in mineralized schist and quartz stringers, from porphyry, and from quartzite in mines in different localities are available. An example is a hard porphyry in Spain, where the footage for a four-point cross-type bit gave an average footage of 360 ft.

Although most of their exhibit is devoted to drilling by rotary means for work in coal and associated stone, **Victor Products (Wallsend), Ltd.**, will include some examples from their range of percussive-drill steels and tungsten carbide-tipped bits and drill stems.

## Conveyors and Conveyor Structures

As might be expected, there will be many products by companies specializing in this field and particulars of some of the more interesting will be found in the following notes.

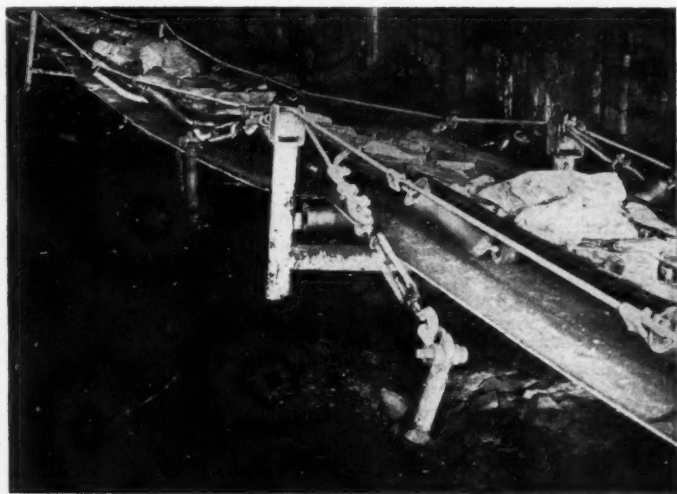
A new design of driving head—the "Two Hundred"—which is intended to take advantage of heavy-duty belts using synthetic fibres in the duck construction and is suitable for great length or steep gradients will be a feature on the stand of **Richard Sutcliffe, Ltd.** Capacities of 200 h.p. to 325 h.p. at speeds from 350 ft. to 600 ft. per min. can be accommodated. It has two 42-in. diameter driving drums of heavy rolled steel mounted on self-aligning roller bearings fixed in renewable housings located along the horizontal joint of the split gearbox. As all other reduction-gear bearings are similarly mounted



**Sutcliffe  
Goliath 50  
Driving  
Head.**

in the same plane, the whole of the gearbox assembly is available for maintenance and inspection without disturbance of any working parts simply by removing the top half. Another new product is the Goliath 50 driving head for gate belts, which is illustrated here. Like the company's Super Goliath and Goliath 80 machines it has the primary drive on the clean side of the belt, thereby promoting increased belt life and makes use of a split first-reduction box, greatly facilitating inspection and maintenance. A further contribution towards ease of maintenance is the use of splined shafts for the mounting of all spur wheels.

Shown for the first time in this country is the Distington-Goodman Ropex Conveyor, which has been designed to extend 50 ft. or 100 ft. without the addition of belting, depending on the number of take-up sections used. Automatic-light signalling provides an indication of the need for belt addition before the limit of stored belt is reached. This will be seen on the stand of **Distington Engineering Co., Ltd.** All operations of the unit, except the belt drive, are performed hydraulically by means of crawler motors which are attached to the head and tail ends and are interchangeable. A belt-spooling device for handling of additional belting, with a



**Distington-  
Goodman  
Ropex  
Conveyor.**

capacity of 100 ft., will not be shown owing to limitations of stand space. The drive is powered by a 35-h.p. electric motor and has a forward speed of 400 ft. per min. and a reverse speed of 200 ft. per min. In the illustration will be seen the method of anchoring ropes by floor pokers. The company will also show a section of the ropebelt-conveyor structure introduced into this country just over a year ago, for which a capacity of 20% greater than conventional rigid or rope-framed conveyors is claimed.

Another manufacturer who is showing conveyors, both belt and chain types, is **Hugh Wood and Co., Ltd.** Rather more interesting in this exhibit, however, is perhaps a signalling system which was mentioned in the *MAGAZINE* in July last for conveyor or haulage control. This, it may be recalled, consists of a length of concentric cable with "clean break" type switches at intervals. The system is interlocked with the control apparatus of either haulage or conveyor and "fails to safety" under all conditions of fault. It has been designed for use on a.c. circuits. By its use machinery is stopped automatically from the signals and dependance on the action of an attendant subsequent to receiving the signals is eliminated.

The Allen-Sotim accumulator conveyor car, shown in the illustration, is designed to increase the effective working capacity of a loader in mine drives. It consists of a hopper which can accumulate a certain tonnage of spoil with a conveying element for transferring this to a discharge point under which a mine car is "spotted." The car can be inched forward to ensure full loads and when full is pushed away by rams for another car to be brought up. The standard car is fitted with a compressed-air motor which drives the conveyor element through reduction gears. The drive from the gearbox to the driving head is a standard roller chain and the conveyor consists of steel crossbars at fairly close pitch with special steel-link chains, running in suitable steel sprockets. The car can be broken down into sections for re-assembly underground. It will form the principal exhibit of **W. G. Allen and Sons (Tipton), Ltd.**

A novel type of troughing idler is to be seen in the Flexiroll conveyor system shown by **Fisher and Ludlow, Ltd.**, the unique feature of which is the roller assembly. This comprises a spring-steel shaft located to hollow-stub axle ends, on each of which is mounted a mild-steel trunnion and shock-absorbing compression spring. The shaft has an initial

set which provides a shallow trough, enabling the most rigid of belts to make contact with the face of all rollers when running light and as the load increases so does the depth of trough. The 4-in. diameter supporting rollers, made of a moulded plastic and canvas material, have graphite-impregnated nylon bearings and between each is a nylon distance piece (also graphite impregnated) which maintains a positive connexion between all rollers.

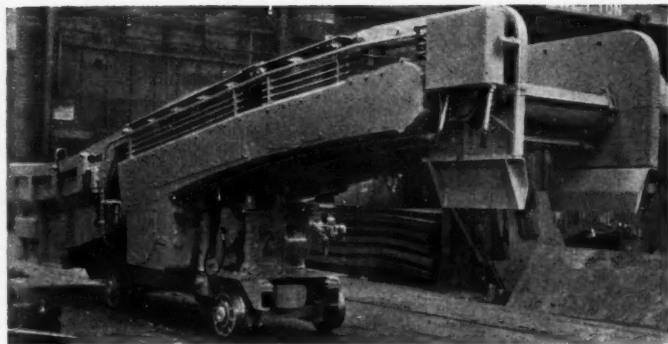
## Hygiene and Safety

Many uses to which the new Pg battery made by **Oldham and Son, Ltd.**, can be put are to be demonstrated. In the cap lamp it is a 4-V lead-acid type with a rubber-covered cable connecting it to a headpiece containing a 1-amp. main bulb and a 0.46-amp. stand-by bulb. The same battery is used in their hand lamps, one of which is approved for use in atmospheres containing methane. A shaft-signalling unit designed to supply a circuit of emergency lighting in a winding-engine room and to provide a power source for signalling, two identically-rated batteries being employed to secure continuity, will be shown. Other emergency lighting exhibited shows the improvement resulting from recent developments in ampere-hour control, which automatically recharges the batteries after failure of mains supply.

A representative selection from the wide range of safety equipment made by **Mine Safety Appliances Co., Ltd.**, for underground work is on show. The M.S.A. air mover,







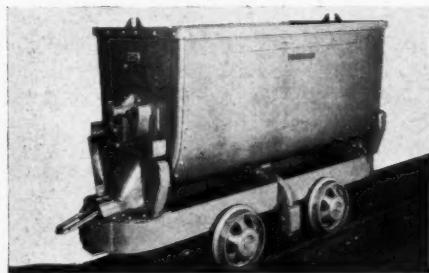
**Allen-  
Sotim  
Conveyor  
Car.**

shown in the illustration, is a selected example. This is a portable ventilating device which uses compressed air and requires no auxiliary motors or fans. The air is fed in through a side inlet and is expended at high velocity through an annular orifice, a powerful ventric effect being produced so that a considerable volume of the atmosphere to be moved is drawn through the bell of the air mover and delivered with the compressed air through the horn. Methanometers, toxic-gas detectors, and a methane alarm for continuous sampling in methane-drainage systems may also be noted.

### Locomotives and Mine Cars

Under this heading attention is called to a number of exhibits—such as, battery locomotives, mine cars, and man-riding trains.

A type of wagon now widely used in this country and overseas on tunnelling work is that shown in the illustration, made by **Robert Hudson, Ltd.** It is double-side tipping, of 40 cu. ft. capacity, and the "U"-shaped body is specially designed to give maximum capacity within minimum overall dimensions. Carefully-chosen loading heights makes it suitable for use with nearly all the standard



makes of mechanical loaders. Exhibited with this wagon is the company's car transfer. Transfers of this kind are proving to be increasingly popular both for high-speed tunnel operation and in mine-heading developments. The object is to ensure that empty cars can speedily be made available for loading by means of a mechanical shovel from a train operating in a heading which is being advanced along a single light-rail track. Using a car transfer of this type any car in a train can be selected and transferred from the main track when the remainder of the cars can be moved up or down the heading as required. In this way the loader can be kept working almost continuously without the usual delays associated with car changeover. Also on this stand is one unit of an Ingham Automat safety man-riding car which would normally form part of a man-riding train. This consists of one master car complete with axle-mounted "Automat" governor for each direction of incline and any required number of brake cars. The whole train is inter-coupled and in the event of overspeed the "Automat" centrifugal governor comes into operation causing the brakes on all cars in the train to function. In addition, any car may be braked by emergency lever, which then automatically brakes all other cars. The train has adequate clearance under all running conditions and may be operated by endless or direct haulage, on straight or curved roads and on steep gradients. It was described in the *MAGAZINE* in January last.

Two of their battery locomotives are shown by **Greenwood and Batley, Ltd.** One is the 14-ton unit arranged for double-end control and having a drawbar pull of 4,000 lb., a speed on level of 8 m.p.h., and a maximum pull on dry rails without sand of 7,500 lb. It is equipped with two 45-h.p. motors for

200 volts and there are two master hand-operated controllers, one at each end, arranged to give seven speeds in each direction with two economical running speeds—*i.e.*, motors in series and motors in parallel respectively. The other locomotive is a 5-ton unit with a maximum drawbar pull of 2,500 lb. and single-end control.

Mine cars and man-riding units are also included in a range of exhibits by **Sheep-bridge Equipment, Ltd.** The cars, designed for underground conditions, are of all-welded construction and fitted with roller-bearing wheels. For man-riding trains a master car is shown, designed to allow an automatic braking system to be used. It has a low centre of gravity to avoid the risk of overturning and is fitted with track brakes and an overspeed clutch. The set is designed to brake from the rear to prevent pile-up and the brakes are applied immediately overspeed from the pre-set position occurs.

### Hoists and Haulage

In this field there will be several examples of recent designs of slusher hoists and other haulage engines.

For the first time at an exhibition there will be a demonstration of the automatic hydraulic haulage gears made by **Austin Hopkinson and Co., Ltd.**, which were described in the *MAGAZINE* in March, 1958. In this most recent addition to the range of hoists made by the company the significant feature is the incorporation of a hydraulic transmission gear by Vickers-Armstrongs, Ltd., known as V.S.G. (variable-speed gear). The drive consists, in fact, of a constant-speed flame-proof electric motor coupled to a V.S.G. pump which delivers oil at pressure through a control valve to the hydraulic motor, the output shaft of which is coupled to the reduction gearing of the hoist proper. A number of the other single-drum and double-drum units marketed under the name of Pikrose will also be seen, including a new unit, the Zero, with 3-h.p. motor and 1,650 lb. rope pull, for small duties. A compressed-air engine suitable for many duties will also be included.

Air-operated hoists and air motors will be seen on the stand of **Holman Bros., Ltd.**, including two and three drum Scrap haulers. A new feature is a remote-controlled Maxam operated reversible air winch.

Single-drum and double-drum units will be included in a number of hoists exhibited by **Joy-Sullivan, Ltd.** For slusher duties two double-drum units are selected as of most interest. These are the C-221, which is one of the company's most recent products, has motors of 50 h.p. or 75 h.p. for rope pulls of 10,800 lb. and 22,800 lb., and is driven through heavy triplex chain reduction, and the R-221. This is the largest in their range and, like the C-221, has the motor located behind the haulage. In this case motors of 100 h.p., 125 h.p., and 150 h.p. are fitted, corresponding to rope pulls of 13,200 lb., 16,500 lb., and 19,800 lb.

### Belting

A range of a dozen experimental conveyor belts made from all-nylon ducks will be shown by **British Nylon Spinners, Ltd.**, who will also be showing P.V.C.-proofed mine-ventilation tubing, nylon-braided trailing cable, and several types of nylon pressure hose. The experimental conveyor-belts will include some which, for their size, are described as among the strongest and toughest ever produced in Britain. There will be a four-ply belt, for example, with a tensile strength of over 7,000 lb./in. Designed primarily for long-centre working—such as, in drive mines—they take full advantage of the great strength of nylon yarn, are lighter in weight, more flexible, and require less power to drive. Among other advantages are that they are completely rot-proof, have high resistance to edge wear, have very high shock strength, excellent fatigue resistance, and high wet strength. The new belts are being produced as a result of development work carried out by the company in conjunction with the trade and besides the work on all-nylon belting they are also engaged on the development of belting ducks made from mixtures of nylon and other fibres.

On the stand of the **Dunlop Rubber Co., Ltd.**, are to be seen five different types of belt for conveying, some with various combinations of synthetic and cotton fibres, others with cotton and nylon in the fabric blend, and others with a special-quality rubber for high-abrasion resistance. There is also a belting with a cover of synthetic-rubber compound for heat resistance up to 350° F.



## Ore-Dressing Notes

### (17) Gravity Concentration.

#### The Shaking Table

In continuation of the discussion of "sluicing action" given in the May issue the specialized sorting which occurs in a single riffle may now be considered. A convenient starting point is that at which down-running sands from the feed distributing box have been caught by the riffle and have moved clear of the feed zone. The riffle is now filled with unstratified sand which is partly settled from its original pulp consistency but still moves fairly freely in the residual water. This denser pulp consists at its head end of particles of mineral of various sizes, densities, shapes, and degrees of liberation, constrained in a long and narrow rectangular channel, the sides of which taper gently from their full height at the feed end to nothing at the discharge on to the unriffled cleaning plane. (Variations from this conventional deck-plan are numerous and receive brief discussion later.) The shaking motion applied to the deck causes the riffle to move toward the discharge end from rest with smooth acceleration. At a pre-set point in this steady movement the direction is reversed abruptly and the riffle decelerates smoothly to the point of origin of the stroke, where gentle build-up of forward stroke again starts. If the deck is supported on inclined trusses which lean toward the vibrator mechanism, this cycle of motion is accompanied by a slight upswing of the riffle. This imparts a very slight tossing, jiggling, or stirring action to the load and tends to aid settlement of fine heavy particles in their downward stratification. The effect of the reciprocal motion is proportional to the frictional grip between the confining walls and the material at any given longitudinal cross-section. Where a particle is pinned to the deck by the pressure of the overriding load it gains the maximum possible kinetic energy (K.E.) during the forward stroke in accordance with the formula:—

$$\text{K.E.} = \frac{1}{2} mv^2$$

where

$$m \text{ is its mass in water } \left( \frac{W-1}{g} \right) \text{ and}$$

$v$  the terminal velocity of the forward stroke. This is modified by the slip of the particle, which varies with deck texture, the constraint due to depth and width of loaded cross-section, the bearing surface of particle against

deck, water-filled voids between particles, the length of "throw" and rate of deck acceleration, and the number of vibrations per minute. Each of these items except those affected by particle shape can be made to respond to careful control during comminution and classification.

The particles not in immediate contact with the walls of the riffle (and particularly with its floor) are less positively gripped as their solid-to-solid contacts are with other particles under conditions of progressively light loading from the bottom to the top of the cross-section. Some plastic flow occurs due to the bridging of closely packed particles between the vertical walls of the riffle, but this is unhelpful in that it impedes the free action of gravity. The concentrating effect in the riffle reaches full efficiency when the particles are sufficiently loose to jostle freely. The heaviest can then burrow down and the lightest work to the top. This rearrangement is going on all the way along from feed to discharge and the build-up of kinetic energy during the forward stroke likewise changes in its incidence. At first, contact with the deck is random. At the end only the smallest and heaviest particles should be in close contact with the deck, where they in turn form a shifting rough bed for the larger heaviest particles. At the same time the tapered construction of the vertical wall is at work, allowing the top (lightest) layer of particles to overflow downward into the riffle below. This reduces the downthrust progressively along the riffle, since it lightens the load pressing upon the lowest layer of sand.

The direct action of the forward stroke upon the water in the riffle is less positive since the grip between walls and fluid is tenuous. An involved action would appear to be taking place, so far as visual study can be trusted. This is a largely unexplored field in which high-speed cinematography might yield valuable information. From his observations the writer holds the tentative opinion that the particles in the riffle play the main part in "paddling" the water forward during the advancing stroke and in turn are sluiced forward by the relatively unaffected water during the retreating stroke. This gives him a composite picture of particles in firm contact with the riffle going strongly forward and of those hopping along just above these as promoting turbulent flow against the inertia of the particles being accelerated from rest during the first part of

the forward stroke. This is succeeded by turbulent braking as stroke-direction is reversed and the now strongly flowing water meets the resistance of particles which are being decelerated by the friction set up by the retreating riffle. The overall effect is a moderately abrupt reversal of sluice action combined with sufficient turbulence to maintain a state of teeter in the riffle. Since, however, the action is horizontal rather than vertical (the case where teeter is normally at work) this action affects the whole size range of the non-resting sands. A further point is that the water, being relatively mobile, runs along the riffle faster than the sands. This would tend to increase the solid-liquid ratio from feed to discharge were it not for a counteracting influence. This is the overflow from the riffle above the one under consideration. Excess water is draining down normal to the longitudinal axis and it carries with it some sand. The balance between water entering with the feed and water added at various points along the run of the table is therefore an important factor in controlling the sand dispersion at any point of progress. The water overflowing downward stirs the next riffle, as do its transported sands. An overall transporting action along the riffle also occurs since the tail end is open, excess water is available, and the reciprocated motion accelerates the overall progress of water relative to sand.

Thus far the forward stroke only has been analytically considered. At its end comes abrupt arrest of the deck, followed by equally abrupt reversal. This sets the adjacent particles skidding forward as their grip on the deck is loosened. The greater the mass of the touching particle, the larger is its available supply of kinetic energy, which it dissipates by friction and collision as it skids to a halt on the floor of the now retreating riffle. The teetering particles above this layer which were less positively urged on during the forward stroke now respond to the streaming effect of the water in which they are partly suspended. This water is least affected by the return motion and tends to run on as a wave, checked mainly by the particles in its path.

Thus, as far as visual inspection shows, the whole cycle of motion in one riffle of an efficiently adjusted deck produces several kinds of streaming effect, according to the position of each particle in relation to the riffle surfaces, the wave action, and the density of population of particles in its

neighbourhood. General control is concerned with solid/liquid ratio, size range of sands fed to the table, running speed, acceleration and crispness of reverse, deck and riffle materials and dimensions, and controlled input of extra water. These and other factors will be considered in the next Note in this series.

E. J. P.

#### (18) Production.

##### Progress with L-P-F Copper

The leach-precipitation-flotation (L.P.F.) process described earlier is now fully integrated in a major scheme at Hayden, Arizona. Using this process Ray Mines expect to improve recovery by 2 lb. of copper per ton from oxides, silicates, and carbonates hitherto largely lost in a flotation mainly concerned with sulphides. These non-sulphide minerals are first leached, then precipitated on finely-divided iron, and then floated as copper metal. The mill head is a trifle under 18 lb./ton (0.9%) in a schist containing intruded quartz porphyry and diabase. Following pilot work in 1955 construction commenced in November and was completed in February, 1957. Recovery in the old circuit was about 80% and in 1958 had risen to over 89%. This plant is the second to use the principle, the first being at Anaconda. A flotation concentrate of pyrite is made from the tailing of the sulphide float. This is roasted to produce sulphur dioxide which makes sulphuric acid in a contact-process plant. The calcined residue is reacted with coal to produce sponge iron required for precipitation of the leached copper.

After rod-milling the mill head sands are separated for leaching in drums, washed, and then ground and given a conventional alkaline flotation treatment for sulphide copper. The classifier overflows from the sand-slime split are leached with the copper-rich acidic liquor from the sand-leaching section, the pH being brought to about 2.1 with make-up acid. This leached pulp, now carrying dissolved copper and some copper sulphide, is moved to precipitating units, where the finely-divided sponge iron is added. Cement copper and copper sulphide are then floated in an acid circuit whence they join the concentrates from the alkaline float and are moved to the smelter by pumps.

For success there must be an excess quantity of minus 35-mesh sponge iron going through the secondary (acid) flotation circuit.

The unconsumed excess is removed by magnetic separation applied to the scavenger tails. This excess of iron prevents any return of the copper to solution and has the further operating advantage of allowing the acidity of the circuit to be controlled for optimum copper recovery without the problem of such re-dissolution arising.<sup>1</sup>

#### (19) Copper.

##### Some Ancient History

An article in the Rhodesian Selection Trust Group's *Horizon* for April, 1959, has brought back to the writer vivid memories of his childhood. It was a common saying around the Hafod in Swansea that most of the inhabitants were copper lined and certainly the keen palate of youth was vividly conscious of the tang of that metal after the holiday spent in the ancestral home diversified by trips round the family smelter. This is hardly an ore-dressing note, but shows what happened in the days before concentrates were worked up at or near the mine. Hand picked and most colourful copper, going at least 8%, was brought in small sailing ships from Cuba, Chile, Peru, and South Africa. Much of this had to come round Cape Horn and sailing conditions were very grim. The old copper works which stretched along the River Tawe went back to 1717; the ruins of some of them can still be seen for six miles up river to Morriston. Describing the ancient situation 86-year-old Mr. W. R. Sullivan says that salmon can now be seen in the river, but when the writer was a child nothing could have been seen in the thick effluent which accompanied the traffic. An able-bodied seaman engaged in the ore traffic got a wage of 45s. a month and a skipper £9 10s. a month. More than 600 ships were engaged in the trade and they were so closely packed at times in the docks that one could walk quite a distance, stepping from one ship to the next. The last of these gallant little vessels arrived back in Swansea in 1902. Their tonnage varied from 200 or 300 up to 1,000, the average being between 800 tons and 1,000 tons. The modern method of grinding and concentrating low-grade ores has certainly taken immeasurable hardship out of the lives of all connected with the transport to Wales of sorted copper ore during the past century.

<sup>1</sup> *World Mining*, Jan., 1959.

## The Future of Nuclear Blasting

That the peaceful usefulness of nuclear explosions has a far greater future than that which awaited dynamite after its invention by Nobel, is claimed by scientists of the Stanford Research Institute at Menlo Park, California. There workers have been gathering data at the Nevada Test Site and are beginning to acquire some knowledge of the effects of the shots. A list of possible projects which would make nuclear blasts of benefit to mankind is beginning to grow as a result of these investigations and point to a wide range of other peaceful uses.

Officially named Hardtack II, the test series undertaken last October were the first conducted underground and made use of several sizes of devices placed in multiple positions. In all, five devices were tested, varying in yield from an equivalent of 70 tons to 23,000 tons of TNT. In this series of explosions, conducted by the United States Atomic Energy Commission, physicists and earth scientists studied the size and shapes of the areas which were affected by the shots. They mapped the amount and extent of the fracturing, faulting, and rock falls on the surface and in the underground tunnels. Their findings were related to the sizes and positions of the nuclear blasts.

Two Research Institute groups participated in the tests. One was under the direction of Dr. Robert B. Vaile, Jr., and Mr. Lawrence M. Swift, of the Physics Department, while the other was directed by Dr. Richard M. Foose and Mr. Robert B. Hoy, of the Earth Sciences Department. The Physics Department team has taken part in several Atomic Energy Commission programmes at the Nevada Test Site. They measured the characteristics of shock waves and changes in elevations and lateral displacements at specific distances from the shots. The Foose and Hoy group investigated effects of blasts in tunnels and on the surface.

Well to the top of the list of uses where atomic explosions seem indicated for the future are, of course, mining, quarrying, and other excavation work. They may also prove useful in extracting oil from shales and tar from sands. Atomic Energy Commission studies are also in progress to use nuclear blasts in rock-salt near Carlsbad, New Mexico, to produce a heat pocket for use in generating electricity. The feasibility of using nuclear explosions for harbour excavation on the northwest coast of Alaska is also being studied.

Since the Hardtack II study has given good indications of what to expect in the terrain surrounding an atomic explosion, scientists can make more specific recommendations as to the size and placing of future shots geared to peaceful purposes.

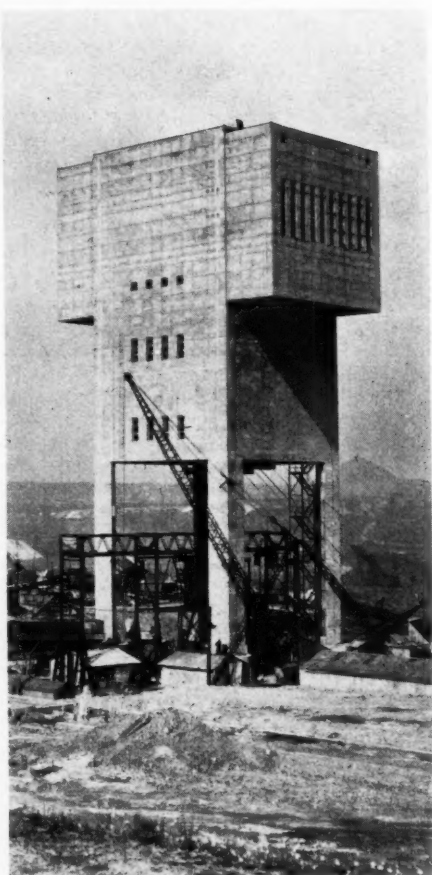
J. GRINDROD.

### The Cementation Group

The Cementation group of companies describe themselves, with good reason, as international mining, civil, and specialist engineers and they have recently held their first Group Management Conference, bringing together in London a total of 100 senior executives from 12 countries, including Britain. An extensive series of discussions about the theme "The Rôle of Management in an Expanding Group" and directed to ways and means of providing better co-ordinated and more effective service to their clients was supplemented by visits to the Bentley Works at Doncaster—the birth-place of the group and the centre of their field activities, supplementing the work done by the large staff at their headquarters in London—and to important contracts in this country.

The members of the conference visited Nant-y-Moch, in Cardiganshire, where the company is constructing a dam, pressure tunnel, and power station for the Rheidol hydro-electric scheme of the Central Electricity Generating Board and at Ffestiniog, in Merionethshire, they inspected a dam, four tunnels, and ancillary works for the first pumped water storage project in Great Britain, a far-sighted and interesting development also being carried out for the Central Electricity Generating Board. Each contract is worth approximately £3,000,000.

Of more direct interest to the mining industry is the work being done at Wolstanton, in Staffordshire, where the delegates were able to see the shaft sinking being undertaken for the National Coal Board. Here the company is sinking a 24-ft. diameter concrete-lined shaft to a final depth of 3,500 ft. and already some 1,750 ft. has been completed. A 1,000-h.p. double-drum winder, giving a maximum winding speed of 35 ft. per sec., is in use, while mucking is done mechanically by means of a wall-mounted crane working with a 12½-cu. ft. cactus grab; excavated material is loaded into 85-cu. ft. buckets supported on trunnions for quick tipping at



Headframe, Wolstanton Colliery.

the surface. Concrete for the lining is mixed at the surface and dropped through a 6-in. pipeline (flame hardened internally to resist wear) and discharged through two 5-in. hoses behind 2 ft. 6 in. high metal shuttering rings. The lining is reinforced by wire mesh secured to umbrella-type wall bolts.

Sinking and lining has been proceeding at the rate of 50 ft. to 60 ft. a week, but additional equipment is now ready and it is expected to increase this rate to 80 ft. a week. In accordance with modern practice strain gauges and temperature recorders are being permanently installed in the lining so that periodic checks on the conditions of the lining and shaft may be readily made.



## Letter to the Editor

### Ores of the Witwatersrand

Sir,—On p. 157 of the March issue Professor C. F. Davidson mentions the publication by the Geological Society of South Africa of an English translation of Ramdohr's paper on the gold-uranium mineralization of the Witwatersrand beds and suggests that this translation saw the light of day because of "the interest taken in the current disputations and a tribute to the force of the hydrothermalist arguments."

As a member of Council of the Society responsible for the publication of this English translation, I would point out that we as a Council are not interested in polemics nor in disputations between theorists. We consider the presentation of facts and observations to be the prime means of extending geological knowledge and it was because Ramdohr's paper in German contained such a wealth of detailed observation that we decided to make the facts embodied in it available to that fairly large body of interested geologists which finds difficulty in easily reading any language but English.

We are, of course, grateful for Professor Davidson's tribute to the excellence of the translation, which agrees so closely with his own; but I would like to assure him and your readers that the considerable expense which the Society incurred in effecting publication was in no sense a contribution to a war effort to combat hydrothermal arguments, however forceful these may appear to be in Professor Davidson's opinion.

S. H. HAUGHTON.

P.O. Box 401,  
PRETORIA.  
April 14.

## Book Review

**Base Minerals of Southern Rhodesia.** Southern Rhodesia Mines Department Bulletin No. 6. By R. B. ANDERSON. Cloth, 184 pages. Salisbury: Dept. of Mines, Lands, and Surveys.

This book has been written at the request of industrialists, miners, prospectors, and students to give in brief compass an account of the minerals which are found in Southern Rhodesia. After some short notes on prospecting accounts are given under the heading

of the metal or of the industrial mineral and in each case there is an indication of the areas in which the mineral deposits have been found and an account of the method of occurrence, with brief details of the characteristics of the particular mineral concerned. The prospector may thus be helped in identifying the specimens he may find and their subsequent development should be made easier by the condensed but comprehensive descriptions of methods of treatment and of the marketing of the product. Unavoidably in a short book of this nature the amount of information given varies considerably with the different metals and minerals and if in some cases the reader is left with many queries he will find that the majority of the accounts are adequately detailed and instructive. As its sub-title "A Handbook of Useful Information Regarding Base Minerals" indicates, this book is intended for a special class of reader to whom it should be helpful and welcome.

B. H. M.

Copies of the books, etc., mentioned under the heading "Book Reviews" can be obtained through the Technical Bookshop of *The Mining Magazine*, 482, Salisbury House, London, E.C.2.

## A New Journal on Ore Deposits

The Academy of Sciences of the U.S.S.R. has lately added to its long list of scientific periodicals a new bimonthly journal<sup>1</sup> concerned exclusively with studies on the geology of ore deposits. From the appearance of the first issue this new periodical promises to be of a high academic standard and seems likely to become the principal Russian vehicle for shorter articles on hard-rock economic geology, which have been hitherto scattered somewhat inaccessibly through a wide diversity of publications. *Geologiya Rudnykh Mestorozhdenii* is edited by Academician Betekhtin, with the collaboration of a distinguished editorial board. Its proposed coverage embraces observational experimental and theoretical studies on metallic mineralizations; papers on novel exploration techniques; mineralogical and mineragraphical researches of economic importance; and surveys of the progress of

<sup>1</sup> *Geologiya rudnykh mestorozhdenii*. [Geology of ore deposits.] Moscow (Academy of Sciences). Bi-monthly from January, 1959. Vol. 1, no. 1 (issued March, 1959), 182 pp., 6 pl. Price 12 roubles (14s.) each issue.

ore science in foreign lands. The initial number comprises seven major papers, a few short mineralogical notes, and five reports of recent All-Union or International Congresses. Unfortunately, save for a table of contents in English, the publication is wholly in the Russian language.

Of the main papers in this issue, a special interest attaches to a short description of copper mineralization in the Proterozoic sandstones of Udokansk in the Olekmo-Vitimsk mountains of Yakutia, where a large disseminated copper-ore deposit was discovered in 1949. The mineralization has since been found to extend with interruptions for over 100 kilometres. Ore-bodies similar to those of Mufulira and Roan Antelope are emplaced in quartzites and argillites, with a zonal arrangement of pyrite-chalcopryrite-bornite-chalcocite in the primary ore. Plastic magnetite is present, rarely with ilmenite and zircon, the magnetite at times making up as much as 10% to 20% of the rock. In the Medny region there are two zoned ore-bodies respectively 50 metres and 30 metres thick in which, over a length of 800 metres, chalcopryrite is gradually replaced by bornite and this in turn by chalcocite. Various recent publications of Rhodesian geologists, lately discussed in Moscow by the Mineralogical Society of the U.S.S.R. (*Zapiski*, vol. 87, no. 1, 1958), seem to have promoted hypotheses on the syngenetic origin of these deposits. The same zoning is seen in the important copper sandstones of Dzhezkazgan (Central Kazakhstan), where it is often complicated by the presence of lead and zinc.

Another important article gives the best available description of the copper-nickel sulphide deposits in the Pechenga (formerly Petsamo) mining field of the Kola peninsula, where out of 160 basic-ultrabasic differentiated intrusions mostly discovered since 1944, 110 have been found to be mineralized with pyrrhotite, pentlandite, and chalcopryrite. Some carry the sulphide ores in their basal layers of serpentinized peridotite, whilst others give rise to rich sulphide mineralization in zones of tectonic breccia and in wall-rock phyllites and tuffs. The serpentine ores are richest in pentlandite and the phyllite ores in pyrrhotite, the two minerals varying antipathetically. A third paper describes the tin deposits of the Yana-Indigirka watershed (Polousny range) in extreme north-east Asia, with typical cassiterite-sulphide skarns and lode deposits, quartz-cassiterite associations with topaz and greisens, and tin-bearing

pegmatites, the tectonic-magmatic control of each type of deposit being discussed at some length.

Other contributions include an essay by Betekhtin on types of uranium ore deposits, based almost entirely on western literature; an account of a recently-explored manganese deposit at Bolshoi Tokmak in the Ukraine; and a description of skarn iron-ore deposits found in 1951 in Southern Yakutia. Reports are given on the geological meetings of the Geneva Conference on atomic energy, on the first All-U.S.S.R. Conference on methods of prospecting for hidden ore-bodies (held in November, 1958—six pages of "decisions" are printed) and on other comparable meetings.

The small edition of 1,000 copies suggests that the journal will be rapidly sold out. If the initial standard is maintained a western translation will certainly be warranted.

C. F. DAVIDSON.

## Engineering Log

At a time when considerable anxiety has been aroused in the West by the excellence and superiority of Soviet abstracting services for technical literature and by the greater profit Soviet scientists appear to derive from information services in a centralized system, it is interesting to see what has been achieved in the United States by one non-governmental organization. The Engineering Sciences Library in New York was established in 1931, when the American Society of Civil Engineers, the American Society of Mechanical Engineers, the American Institute of Mining, Metallurgical, and Petroleum Engineers (as it is now known), and the American Institute of Electrical Engineers merged their separate and well-established libraries. The result of this co-operative action is a library outstanding in its coverage of the branches of engineering which are the concern of the co-operating institutions and, in addition, the library covers chemical engineering and all other branches at the level of the practising and graduate engineer. Contents of the library include more than 175,000 volumes, 20,000 maps, 5,000 translations, and 10,000 bibliographies and indexes, with 1,500 periodicals currently received from all over the world. Book selection is on a world-wide basis. Complete files of technical publications and unpublished papers of members of the

founder institutions are maintained. Photographs and microfilm copies of members' publications are supplied to inquirers by the library when these publications are out of print. The founder societies' journals contain some 600 brief reviews of new publications each year and those concerned with new accessions to the library are published in each issue of *Mechanical Engineering*. The reading room has a staff equipped with library and technical qualifications and is open most of the year for six days and five nights of the week. Brief inquiries from members of the founder societies and from others are answered without charge. For information requiring more extensive searching, including the preparation of annotated bibliographies, a fee is charged. Translations and photocopies are made. Except for the loan of books, which is a service available only to members, all services are available to anyone, in person, or by mail, telephone, or telegraph. The Engineering Index, a separate organization housed in the same building, reviews 1,400 leading periodicals and serves as an index to many of the publications in the library, all of which are made available to Index staff. Joint ownership is managed through the United Engineering Trustees, Inc., formed by the founder societies to operate the building. The Library and the Engineering Foundation are both departments of the U.E.T. and the activities of both Library and Index are expected to grow in succeeding years. A fifth society, the American Institute of Chemical Engineers, has recently joined in support of the library and it is anticipated that others will follow when the societies move to the new building to be erected near the United Nations. The broadening of support and interest will surely lead to greater and better information services for the whole engineering profession.

\* \* \*

In an article published recently in *Nature* Drs. John W. Graham and Susan G. Cooper, of the Woods Hole Oceanographic Institution, Massachusetts, suggest that the valuable mineral "pebbles" occurring on the ocean bed may have been originally formed by living organisms. These manganese deposits have attracted considerable attention from scientists in the past. In addition to manganese, the nodules contain substantial quantities of nickel, copper, cobalt, and iron. Some investigators have been of the opinion that recovery of the minerals could be profitable. Although the origin of the deposits

is unknown some scientists considered that they were formed by inorganic processes. Drs. Graham and Cooper, however, believe the nodules were formed by an organism, as yet unidentified, which made its home on the outer coating of the larger foraminifera after the larger organisms had died, being attracted thither by the rich protein content of the coating. The unidentified organism was able to extract and so to concentrate metals from the sea water while using the water for its subsistence. The theory of biological origin of the nodules is supported by an analysis of mud dredged from the Atlantic Ocean bed 3 miles below the surface of the water, near Bermuda. Chemical tests of the samples of light-brown mud from this source indicate that the metallic material was formed as a surface deposit on the foraminifera and did not result from capture by living foraminifera of manganese-bearing particles in the sea water.

\* \* \*

The New Jersey Turnpike, supreme among the great toll roads of the U.S.A., has been in operation for seven years and has set new records every year during this time. The 203,000,000 vehicles that have passed over it probably make it the most successful road ever built. In the first two years of operation traffic and toll revenues had already amounted to a figure higher than engineers had estimated for 1957 and another estimate by engineers was that by 1956 the turnpike had already seen the equivalent of 34 years' service at the normal anticipated rate of traffic flow. In 1958, in fact, 41,000,000 cars, buses, and trucks used the turnpike. The toll road, which is 118 miles long, was built in the record time of under two years and constructed of heavy-duty asphalt concrete at a saving of \$5,400,000 on competitive alternative bidding for slab pavement. This made for speed and economy and the decision was also influenced by the Korean war, which caused a critical materials situation. This type of construction was, moreover, particularly well suited to the task and its problems. In the northern section the road cuts across the Jersey marshes and here the engineers were posed major problems of both bridge and highway construction by soft deposits as much as 100 ft. deep. Vertical sand drains proved the solution and facilitated early opening of this section. Because of the speed required and the nature of the problem, however, not all the soft areas were effectively stabilized at that time. In 1954 asphalt

concrete began to be used to restore the road's profile in some settled areas and this operation is still in process to some extent. Settlement is slowing down, however; 48,000 sq. yd. of hot mix were used in 1954 and 4,000 sq. yd. in 1958 for this purpose. Slab settlement on the approaches to bridges has been a further problem. Mud-jacking has been used to raise slabs to the original level, or peaks have been reduced by sawing or pavement breaking and resurfacing with asphalt concrete. Either method involves costly manual labour. Some longitudinal cracking developed in fill areas next to bridges and in the sand drains' section in 1956, the trouble being thought to be due to water trapped in the penetrated macadam base or the sub-base. Where a third traffic lane had been added in 1955 some longitudinal cracking developed into the centre lane in fill areas, the result of a loss of lateral support while the widening was in progress. Cracks of this type have been successfully sealed with rapid-setting asphalt emulsion covered with a sharp hard stone sand. The outside lane, which carries most of the heavy-truck traffic, shows some minor channelization and grooving, but this condition is not yet serious enough for immediate attention. For some local patching a silica-sand-asphalt mixture with feathered edges has been used successfully and the authorities expect to use the same material and method to restore the grooves to correct profile. The road design has proved adequate to an unprecedented load of traffic and the engineers responsible are determined to maintain it in first-class condition for the millions of users yet to come.<sup>1</sup>

\* \* \*

The Garrett Corporation's AiResearch Manufacturing Division at Los Angeles, California, have been using a new technique to test the reliable performance of turbine blades by shooting ice bullets at them. The blades are part of a turbo-compressor designed by the Division for the Boeing 707, forming part of an air-conditioning and pressurizing system used for both military and commercial jet aircraft in the U.S.A. The  $\frac{3}{4}$  in. diameter moulded-ice bullets are blasted by means of compressed air, stored at 80 p.s.i., into the revolving blades at the rate of one a minute. Speed on arrival is about 675 ft. per second. In this manner scientists have been able to simulate icing factors occurring at an altitude of 30,000 ft. when the Boeing is making a

transcontinental run. All blades are reported to have withstood the test.<sup>1</sup>

\* \* \*

The U.S. Army is planning to gouge a covered highway 100 miles long out of the Greenland ice cap to supply a remote camp currently under construction. The cut for the road will be 28 ft. deep in the ice and 22 ft. wide, allowing two lanes of traffic. It is probable that vehicles using the road will be propelled electrically so as to avoid the risks inherent in the carbon-monoxide exhaust from internal-combustion engines. A rail system and a cable system are being considered. An alternative scheme mentioned by Robert R. Philippe, of the U.S. Army Corps of Engineers' research and development division envisages building the roadbed out of pressed-snow briquettes and directing wheeled vehicles by means of shallow chutes in the roadbed. Basing his estimate on experience of short experimental Greenland roads, Mr. Philippe thought construction could move ahead at the rate of 4 miles a day. Concrete highways move at best about a mile a week. Peter snow millers will be used in the work. The first of these will dig a trench some 5 ft. deep and 7 ft. wide. Two following machines will deepen the undercut and a second undercut to the full width will be made by two groups of three machines following these. Metal roof forms will be used to cover the 7-ft. opening along the top of the roadway. Powdered snow thrown out by the millers will be deposited on top of these forms and as the snow hardens the forms will be removed. The sunlight filtered through the snow roof will light the road adequately and will colour the lower surfaces with blue and purple light.<sup>2</sup>

## News Letters

### VANCOUVER

May 6.

**Iron Smelter.**—The Consolidated Mining and Smelting Co. of Canada, Ltd., is to commence at once the construction of an iron and steel smelter to treat the tailing from the Sullivan mill—the first step of an integrated operation estimated to exceed \$20,000,000 in cost. The plant will be the first of its kind in western Canada and will be entitled to the British Columbia Government's bounty of \$3.00 per ton of iron

<sup>1</sup> *Compressed Air Magazine*, April, 1959.

<sup>2</sup> *Science News Letter*, April 25, 1959.

<sup>1</sup> *Asphalt Institute Quarterly*, April, 1959.



produced from ore on which no tax has been paid under the "Mineral Property Taxation Act" and \$5.00 per ton on ore which has been taxed under that Act. Furnace facilities will have a capacity of 100,000 tons of steel per year and will include also an electric furnace to produce 36,500 tons of pig-iron annually. The addition of a second larger furnace and oxygen-blown converters for the production of steel ingots, together with fabricating facilities, will follow completion of the original plant in 1961.

The company's large reserves of iron tailing from the Sullivan mill have long been recognized as one of the many sources of raw material for a primary iron smelter in western Canada. Reserves equivalent to 15,000,000 tons of recoverable iron have accumulated over the years and current mine production increases these reserves by the equivalent of 350,000 tons each year. This raw material will be made available to the project in the form of high-grade iron oxide containing over 60% iron. The Kootenay and Pend d'Oreille Rivers and the proximity of coking coal and limestone in the Crow's Nest Pass area constitute a unique combination needed for the electro-thermic production of iron and steel.

**Portland Canal.**—Silbak Premier Mines is to make a further effort to obtain salvage from the gold-bearing burned material and debris in the ruins of the former 600-ton mill. A complete review is being made of all old geological reports in the hope of orienting a new geophysical survey.

**Vancouver.**—Taiga Mines has found strong indication of extension of its germanium deposit, 11 miles south of Powell River. The original discovery was made along Lang Creek, where outcrops indicated a continuous length of over a mile with a lateral interval of 2,000 ft. between parallel exposures. In recent work an 8-in. hole was churn-drilled to a depth of 300 ft. in the Kelly Creek area, 2,000 ft. west of the previous westernmost indication. This hole, which was terminated only because the depth represented the limit of the equipment, penetrated through the same favourable sandstone formation, generously laden with coal fossils. An attempt is now being made to extend the north boundary. The drilling is being done by Pacific Water Wells, Ltd., of Nanaimo.

**New Westminster.**—The value of the investment portfolio of Pacific Nickel Mines is currently equivalent to 54 cents per share of issued stock. Western Nickel, the operating

company in the short-lived nickel-copper project of 1958, expects to receive sufficient money from the negotiated-contract cancellation with European purchasers of metal produced to pay all bank loans and to repay a loan of \$242,600 with interest which had been advanced by Pacific Nickel.

**Lillooet.**—The Bralorne division of Bralorne Pioneer Mines produced 25,991 oz. gold from 38,705 tons of ore grading 0.67 oz. gold per ton in the first quarter of 1959. The company's Pioneer division produced 10,548 oz. from 26,442 tons grading 0.399 oz. per ton in the same period. The company's board of directors has been increased from nine to twelve and four alternate directors have also been named. Staff changes at the mines include the promotion of Mr. Charles Musser to superintendent of mills and the appointments of Mr. Martin Stevens as mine superintendent of the Pioneer unit and Mr. Charles Campbell, Jr., as mine superintendent of the Bralorne unit.

**Cariboo.**—Cariboo Gold Quartz Mining, although greatly encouraged by the discovery of good-grade replacement ore in what is now termed the "Burnett Fault" area, is continuing the long drive to the originally projected destination, the Mosquito Creek fault. Concurrently stopes are being prepared on the Burnett ore-bodies and rises will be put up to determine vertical persistence. The annual meeting on April 15 was informed that the subsidiary (French Mines, Ltd.) had repaid \$74,900 to the Cariboo treasury before the end of 1959 and an additional \$18,500 since that date.

**Kamloops.**—Skeena Silver Mines, despite an unfortunate loss of \$100,499 in oil-well investment during 1958, is to pursue its exploration policy during the current year. The company is hoping that a major operating company will become interested in the further development of the Divide copper prospect in the Highland Valley, where ore-bodies of considerable value have been indicated. Other mining properties at Skeena Crossing, B.C., and Uranium City, Saskatchewan, are being maintained in good standing.

The Kamloops Copper Co., Ltd., is re-examining the results of a self-potential geophysical survey that outlined an extensive anomaly late in 1958 on the north end of the company's holdings which include the Iron Mask mine. If the results are confirmed a diamond-drilling programme will be initiated. The company is also planning a

magnetometer survey on its Viking group a half-mile north of Craigmont.

The Newmont Mining Corporation of Canada has terminated its agreement for the development of the Highland Valley mine of Trojan Consolidated Mines. Trojan is reported to be negotiating with other exploration companies for further work.

**Nicola.**—Birkett Creek Mine Operators, Ltd., has established a new portal for the driving of a new low entry at 3,000 ft. elevation into the property of Craigmont Mines. At mid-April the face of the original entry had been advanced to a point 2,535 ft. from the portal at the 3,500-ft. horizon. Birkett Creek, the operating company, is owned 50% by Canadian Exploration, Ltd., 25% by Noranda Mines, Ltd., and 25% by the Peerless Oil and Gas Co.

Torwest Resources announced late in April plans for the sinking of a shaft and the preparation of the Aberdeen mine, five miles north-east of Craigmont, for early production. The diamond-drill programme of recent months has yielded exceptionally encouraging results and the management feels that mill construction will have to be considered in the near future. In early May a firm underwriting of the company's capital shares was reported to have been obtained from Toronto interests.

**Similkameen.**—Granby Mining suffered a net loss of \$19,401 in the first quarter of 1959, during which period the plan for revision of the company's name, charter, and bylaws was approved by the shareholders and the capital structure was increased from 600,000 to 2,000,000 shares. The subsidiary—Granisle Copper, Ltd.—plans to resume drilling on an island in Babine Lake, where work was last done in 1956 with some encouragement. Production has been commenced by another subsidiary (Phoenix Copper Co.) which has re-opened properties worked by Granby during the first 20 years of this century.

**Greenwood.**—An exceedingly optimistic report was given to shareholders of Highland-Bell, Ltd., at the annual meeting on April 29 by Mr. Karl J. Springer, the company president. He said the company had expended considerably more funds in outside exploration than other companies of comparable size; a policy which has proved unusually fruitful. All investment in the Mattagami Syndicate has now been repaid and Highland-Bell holds stock with a value equivalent to a dollar for each issued share. The company also holds participating interests in several other active prospecting syndicates, notably

16½% in the Mackenzie Syndicate which is operating along the Northwest Territories-Yukon boundary not far north of British Columbia. Preliminary investigation has indicated a large tonnage of exceptionally good-grade tungsten ore and although the metal is not in demand currently Mr. Springer expressed confidence in its eventual resurgence and classified the prospect as one of "great possibilities." In one place, sampling over a width of 40 ft. revealed grade exceeding 3%  $WO_3$  and in several instances ore widths exceeded 100 ft. within a length of five miles. The ore also carries about 0.5% copper. Some 30 miles to the south the Mackenzie Syndicate has staked an extensive lead-zinc prospect which also covers a length of five miles or more in an area described as possessing intensified lead-zinc mineralization.

**Nelson.**—The annual meeting of Reeves MacDonald Mines, Ltd., on April 28 was advised by the president, Mr. Jens Jensen, of Spokane, that the mine at Remac has responded most favourably to development and now, after ten years of continuous extraction at 1,000 tons per day, ore reserves are fully 1,000,000 tons greater than when production was undertaken. During the first quarter of 1959 operating experience has been more profitable than in the corresponding quarter of 1958 but less so than in the last quarter of that year. One-third of the zinc concentrate produced last year remains stockpiled at the property. Mr. Jensen said there is hope of disposing of this during the coming summer months. A strong advocate of voluntary cutbacks in the production of zinc to at least 20% of normal output, Mr. Jensen said Reeves MacDonald would continue to produce at capacity until Canadian producers agreed to the proposed reduction. He maintained that both Canadian and United States producers of zinc were rapidly pricing themselves out of any export market.

**Anglo-Turkish Development Co.**—The Anglo-Turkish Development Co., the recently-organized British Columbia company which has acquired options on several mining and oil prospects in Turkey, is awaiting an early report from Dr. H. T. James and Mr. Chris Riley, the geological engineers, who have engaged a third engineer, an American, as an assistant in the examination and appraisal of copper properties in the State of Malatya. A 124,000-acre oil concession has been farmed out by the Anglo-Turkish to Calgary interests.

## TORONTO

May 26.

**Gold Production.**—The output of the gold mines of Ontario for March included 223,728 oz. of gold and 33,045 oz. of silver, valued at \$7,616,425, from 807,952 tons of ore milled. The March "Gold Bulletin" of the Ontario Department of Mines reports that in the first quarter of 1959 the 30 producing gold mines in the Province reported milling 2,334,973 tons of ore, containing 665,357 oz. of gold and 95,870 oz. of silver, valued at \$22,732,512. In the same period of 1958 the 30 mines reported milling 2,313,756 tons of ore, containing 659,509 oz. of gold and 105,255 oz. of silver, valued at \$22,584,195.

**Blind River.**—Shareholders of Algom Uranium Mines and Pronto Uranium Mines were informed earlier this month that the companies, under the management of Rio Tinto in Canada, had received confirmation of additions to their present contracts for sales of uranium precipitates to Eldorado Mining and Refining. The existing contracts will be completed by the end of 1960 approximately in the case of Pronto and September, 1961, in the case of Algom. The newly approved additions, which have been under negotiation for some time, will enable the companies to produce at their current rates until March 31, 1962. In the case of Algom the agreement will mean delivery of approximately 2,500,000 lb. of uranium oxide, valued at \$20,000,000. Pronto will deliver an additional 1,500,000 lb., valued at \$12,000,000. At present rates of amortization, it is stated, the plants of both companies will be fully written off over the life of the existing

contracts and before the \$8 price now agreed goes into effect. In both cases the contracts covering the additions include agreements giving Eldorado Mining and Refining, Ltd., options on the output of the mines up to December 31, 1966.

The Rio Tinto Mining Co. of Canada announced recently that Northspan Uranium shows continued improvement in operation. As a result of strict grade control and consequent higher-grade ore tonnages milled have been reduced from 259,000 tons in January from the Northspan mines (Lacnor, Panel, and Spanish American) to 219,000 tons in April from Lacnor and Panel only. The closing of Spanish American as an efficiency measure has already proved beneficial. During this time the amount of uranium oxide produced has increased from 416,000 lb. in January to over 442,000 lb. in April. At Lacnor the average head grade increased to 2.047 lb. per ton in April as compared with an average head grade of 1.89 lb. per ton during 1958. At Panel the corresponding figures are 2.408 lb. per ton in April and 1.95 lb. per ton for 1958. Northspan has continued to meet its debt carrying charges and is making progress in reducing its liabilities. The company is at present mining ore from Algom claims under an arrangement with that company, the charges for which are included in operating costs. Whereas average operating costs at Lacnor during 1958 were \$12.93 per ton, they have been reduced to \$10.72 in April, including development and ore charges. At Panel similar costs were \$13.45 per ton for 1958 and \$12.02 per ton for April. Both Northspan mines are engaged in depth development



Thompson  
Townsite,  
Manitoba.

programmes which when completed will greatly improve mine efficiencies.

**Saskatchewan.**—It was announced on May 13 that Rix Athabasca Uranium Mines, in the Beaverlodge area, is actively exploring on its original property and on the claims recently acquired from the Pardee, Amax, and Aurora groups. In view of the possible end in the reserves of the Smitty workings some time in the near future the company has been energetically seeking a replacement of the ore which is suitable for treatment in the Lorado custom mill. The programme includes further diamond drilling in the lower levels of the Smitty shaft, surface mapping, and drilling in the areas reachable from the Smitty and Leonard workings, as well as investigations of favourable geological structure elsewhere on the property. The latter approach may involve sinking a new shaft serviceable from the existing plant facilities and is looked to with some optimism. The Leonard shaft is to continue to produce ore against its contract with Eldorado Mining and Refining, with shipments scheduled at 100 tons per day.

**Manitoba.**—The Hudson Bay Mining and Smelting Co. reports a profit of \$7,392,888 for 1958, which compares with \$8,039,303 for the previous year. Gross income from metal sales in 1958 totalled \$40,783,450. These sales included 105,208 oz. of gold, 1,593,329 oz. of silver, 90,909,908 lb. of copper, 119,697,591 lb. of zinc, and 342,587 lb. of cadmium.

The accompanying photograph is of a model of the Thompson townsite. It shows how full advantage has been taken of the natural setting along the banks of the Burntwood River. Thompson is on the way, it is thought, to becoming one of the most modern and attractive communities in Canada. Three distinct residential areas as well as an industrial area have been planned around the central business section, while the railway siding and station are located to the east of the town and connected by a road which leads directly into the business area. Plans of the town have been completed on the basis of a population of 8,000 people.

**Exploration.**—The report of the Anaconda Company for 1958 states that field work in Canada pointed to interesting areas for further work. Bulk sampling was initiated at the newly acquired Nakina iron property, in western Ontario, to provide tonnages for pilot metallurgical testing.

**Quebec.**—During 1958 the gold output from

Quebec Mines totalled 1,044,826 oz., valued at \$35,503,190. These figures compare with 1,010,272 oz. and \$33,768,543 in 1957. The December gold output was 82,158 oz. and that of silver 324,480 oz., which brings the silver output for 1958 up to 3,954,364 oz. In the year 264,682,560 lb. of copper and 114,163,142 lb. of zinc were produced.

Aluminium, Ltd., reports a net income of \$2,310,000, equivalent to 8 cents a share, for the March quarter, as compared with \$5,331,000 or 18 cents a share for the corresponding period of 1958. Consolidated sales of aluminium in all forms were 124,000 tons in the first quarter of 1959 compared with 128,000 tons in the 1958 period. The Aluminium Co. of Canada, Ltd., whose accounts are consolidated with Aluminium, Ltd., reports a net loss of \$913,106, as compared with a net income of \$4,517,020 for the first quarter a year ago. This result is attributable to shipping losses and a decline in volume of shipments to affiliated selling companies, as well as a lower return from sales.

## MELBOURNE

May 20.

**Gold Mining.**—The position of the gold-mining industry, faced with the fixed price of its product and steadily rising costs, has necessitated assistance from the Commonwealth Government to the borderline companies. This assistance is doubly important to the State of Western Australia, where large portions of its area are almost solely dependent upon gold mines for the maintenance of a sparse population. Subsidies paid by the Commonwealth to the industry in 1958 amounted to £A733,528. The Gold Mining Assistance Act will expire on June 30, 1959, and the Chambers of Mines of Western Australia, Victoria, Queensland, and the producers of the Northern Territory have made representations to the Government for its renewal, with expansion in its provisions in certain directions. It was pointed out that the assistance is vital to the economy of the Commonwealth and that a greater measure of assistance is needed.

At present the subsidy is at the maximum rate of £2 15s. an oz. to companies and £2 per oz. to small producers. It was requested that the maximum be raised to £3 10s. an oz. and that greater assistance be given to marginal mines to permit more active development; that development be en-



couraged by a development allowance of 4s. per ton and that prospecting for gold be encouraged by a £1 for £1 subsidy on diamond drilling. It was also requested that loans be made to approved companies to assist in bringing these enterprises into production.

The requests have been submitted to Parliament, but so far only the matter of the subsidy has been dealt with. The industry will now receive subsidy to the maximum amount of £3 5s. an oz. to companies and a flat rate of £2 8s. an oz. to small operators. The assistance under the new rates of subsidy will be valuable to the industry; that covered by the other requests is equally so, as giving encouragement to prospecting, development, and the prolonging of the life of operating mines as well as leading to new discoveries.

Development work at the Hill 50 Gold Mine, Mount Magnet, has located a new lode. This company has had a spectacular career in recent years and has, to date, paid out in dividends the sum of £A4,750,000. Below the 1,000-ft. level the grade of ore decreased and it was then decided to increase mill capacity and mine a greater tonnage of ore. The milling grade fell from about 14 dwt. to 9.45 dwt. gold per ton. In the year to date the mine has produced 131,761 tons of ore and recovered 62,516 fine oz. of gold, an average of 9.49 dwt. Development work at the 1,304 ft. level was generally in low-grade material which continued to the 1,552-ft. level. Diamond drilling from the north main drive at this level has located payable values in a new lode which is estimated to contain 82 tons per vertical foot; the estimated grade is 8.5 dwt. per ton. Although low by comparison with past history, this value is good when compared with general Western Australian grade, which is below 6 dwt. per ton.

**Broken Hill.**—Developments in the Broken Hill South mine are of particular interest. For a long period ore reserves have been shrinking because of the southerly pitch of the ore-bodies to the Zinc Corporation property. It has been considered that reserves would be confined within the north and south boundaries of the South mine leases where extension in depth was steadily decreasing. Important additions were gained by the acquisition of the old Broken Hill Proprietary Block 10 and Central mines leases with large blocks of remnant ore. These are now very largely depleted and in

consequence a number of men were dismissed late in 1958. Ore reserves were then estimated at a life of 4½ years. For some time the company was prospecting to the west of the main lode in country containing a zone of mineralization, on which two shafts had been sunk at the north end of the line of lode in the earlier years of the field, one to a depth of 1,300 ft. but with discouraging results and the abandonment of all further work. South Mine diamond drilling on the western flank of the anticline with other exploratory work has given encouragement to the view that payable ore-shoots do exist on this flank. These bodies are stated to be quite distinct from the ore-bodies of the main lode which have been worked in the past. The widths disclosed are less than those of the great ore occurrences in the main lode, but it is considered that working costs will be less than those characteristic of the wider occurrences. It has also been stated that it is now clear that there is ore available in the main lode zone appreciably in excess of the published figures, which gave a reserve of 1,600,000 tons. Diamond drilling in the lower synclinal part of the main orebody has intersected payable ore and the north drive from No. 7 shaft, on the 1,940 ft. level, has exposed ore on the next synclinal position north of the last known exposure and 270 ft. below the nearest level.

Development and drilling west of the main orebodies and down dip of the favourable bed suggests the existence of an important ore occurrence. Exploratory work is to be commenced at the 1,450-ft. level working from No. 7 Shaft. In the Delprat shaft section of the old Broken Hill Proprietary leases a winze has been sunk from the 1,000-ft. level to the 1,100-ft.; values for 73 ft. were 10.5% lead and 13.6% zinc. The furthest south development is 4,000 ft. south of this point, indicating a zone of possibly considerable length.

The South company has made intensive study of the geological structure of the field and has examined areas away from the original leases. Geological and geophysical work has shown three areas of interest. The largest of these areas is south-west of the main lode and the others are to the north of the South mine. The surrounding areas have been closely examined by several of the companies in recent years, but these results appear to be the first of potential importance.

**Mount Isa.**—An industrial agreement between the Mount Isa company and the

industrial unions has been ratified by the State Industrial Court. The agreement provides for increases to certain classifications of up to 8s. 5d. per week, and the fixing of the lead bonus at a minimum of £5 per week. Penalty rates provided are time and a quarter for Saturday work and time and a half for Sunday work for all continuous shift workers. Continuous shift workers will also get an extra week's holiday, making a total of four weeks and two days per year. Travelling time will be paid to workers outside a three mile limit from the mine.

**Mary Kathleen Uranium.**—This large uranium mining company in North Queensland has declared its first dividend, of 1s. 3d. per stock unit, in less than 11 months since milling was commenced. Profit for the first three months of 1959 was £A746,259, which compares with £A1,417,266 for the seven months from June 3, 1958, when ore treatment commenced, to December 31, 1958. The dividend requires £A355,230 and will be tax free in the hands of shareholders, as profits from uranium mining are exempt from taxation. Gross revenue for the quarter was £A1,450,947, and mining, milling and administration costs were £A588,059. In the period the mill treated 120,000 short tons for the production of 327,000 lb. uranium oxide.

**Brown Coal.**—The great enterprise at Yallourn and Morwell, Victoria, is expanding in directions other than electricity and briquettes. The brown coal has produced a char which may displace metallurgical coke if sufficient hardness can be developed. This is being produced in a small plant on a semi-commercial scale. Town gas is now being produced at Morwell and is piped to Melbourne, supplying one-third of the metropolitan area's daily requirements. This gas is enriched before final delivery by oil refinery gas. Future development plans provide for extensions to the present gas plant and for the gradual closing down of the conventional plants until the greater part of the State's gas needs can be met by the Lurgi plant at Morwell.

The latest development in brown coal products will be the construction by the Gas and Fuel Corporation at its Morwell brown-coal plant of an installation to produce liquid fuel, a development which would be of great value to Australia in the present absence of any internal supply of oil. It is stated that the Corporation plans to install the first unit of the liquid fuel plant by 1963.

The Electricity Commission's open-cuts at Yallourn, Yallourn North, and Morwell produce 10,000,000 tons of brown coal per year. By 1963 the Yallourn cut will increase its production from 7,700,000 tons to 12,500,000 tons and the Morwell cut will raise 6,500,000 tons for the projects depending on it. Installed capacity of the Yallourn power station is 381,000 kW and an extension is under construction which will contain two generators, each of 120,000 kW. Current from the Snowy Mountains hydro-electric undertaking in New South Wales will be fed into the Victorian system.

**Oil Search.**—The Commonwealth Government intends to assist the search for oil to the extent of £A1,000,000 per year for three years and to assist in its proposals an overseas consultant will advise the Government. In order to attract overseas capital to the assistance of the local enterprises tax concessions are to be broadened and concessions now applying to local investors will be extended to overseas investors. These concessions are aimed to encourage the inflow of capital, the search for oil, and its intensification. The Government now supplies the technical services of the Bureau of Mineral Resources, carrying out geological and geophysical surveys, and makes available substantial subsidies for structural drilling. Taxation concessions have been made to oil exploration companies and the work is receiving considerable Government assistance. The importance of the discovery of oil to this country is immense, for the development of the use of oil fuel in very recent years has been remarkable in industry, railways, and agriculture. The position is such as to be a matter of urgency to assess correctly the oil possibilities of Australia and New Guinea and, if possible, to develop an oil industry.

**New Guinea.**—With the decline of Bulolo Gold Dredging the mining industry in New Guinea has reached a low level. Oil search is still active and is being intensified, but there is nothing spectacular or of particular importance in prospecting for gold or other metals. Two gold-mining companies are operating in a moderate way, apart from Bulolo, and consequently the entry of King Island Scheelite (1947), Ltd., will be watched. This company was the largest tungsten producer in the Commonwealth but was compelled to close down with the collapse of the tungsten market. The mine on King Island is being maintained ready for resumption, with ore reserves of 2,571,000 tons

worth 0.487%  $WO_3$ . The company has built up investments of £A783,306 and has now joined forces with a prospecting company (Australian Gold Development) to explore and develop a gold prospect in New Guinea, the King Island company to finance the work.

Reports of the initial prospecting work appear to have been encouraging and the establishment of another gold producer in the Territory to supplement Bulolo will be important. The Bulolo company is now operating one dredge on the remaining dredgeable ground; there are areas unsuitable for dredging and substantial gold output is being obtained from this ground by sluicing. It was reported that the Administration intended to carry out geological and other work with the object of re-establishing the mining industry in the Territory.

**New Zealand.**—The New Zealand Coal Utilisation Committee is considering the production of titanium oxide from the West Coast. The Dominion now imports 3,000 tons of titanium oxide per year. The minimum commercial unit would have a capacity of 10,000 tons per year. The Committee is also considering subsidiary industries that might assist the West Coast coalfields, one industry which seems to be favoured is the manufacture of nitrogenous fertilizers. Coal is now the principal New Zealand mineral; gold mining is carried on mainly by two dredging companies, but otherwise there is little or no interest in mining except for oil drilling in the North Island and uranium exploration in the Buller Gorge country.

**Lead-Zinc.**—It is considered unlikely that international arrangements for stabilizing the lead-zinc market will cause further cuts in Australian production. Broken Hill made an early cut of 10% by cutting out one shift per fortnight, but despite this cut concentrates are being stockpiled at the mines. Mount Isa Mines also made an early reduction in output. The Government attitude favours the industry concerned making the decisions affecting it, rather than the Government applying any arbitrary formula.

## FEDERATION OF MALAYA

May 10.

**Tin: Future of Buffer Stock.**—Sir Ewen Fergusson, chairman of the Straits Trading Co., Ltd., told the annual meeting in Singapore that a decision would soon have to be

reached about the orderly disposal of the remaining tin in the International Buffer Stock. He said he presumed that the first steps towards disposal of the stock would be taken at the next meeting of the International Tin Council in Copenhagen later this month and estimated that the stock would be between 15,000 tons and 18,000 tons by July this year.

The International Tin Agreement was due to expire on July 1, 1961, he said, and it was clear that the approaching phase was most important. He raised some questions which would exercise the minds of tin producers and consumers for some time to come. They were: Will the council decide on total liquidation during the remaining two years? Will it be able to negotiate an extension of the present agreement which would postpone the liquidation period to a more distant future, thus enabling the scheme as devised to have a chance to operate—that is, in the price brackets of £780-£830, when the manager cannot sell, and £830-£880, when he may sell? Or will the framework of the agreement be subject to temporary alterations, as at present, when the manager is empowered to sell in the £780-£830 range? Sir Ewen added: "In particular many producers would like to see some of their contributions to the Buffer Stock paid back in cash. Repatriation of such funds to the actual producers would be of benefit to many of them and to the countries in which their mines are situated." It was safe to say there had been steady sales from the Buffer Stock in the past two months. "It may not be wide of the mark to suggest a figure of 20,000 tons as the present holding, or to suggest that a continuance of export control at current rates would see the stock liquidated in the first half of next year."

Referring to the bartering of tin for agricultural produce introduced by the U.S. Government, Sir Ewen said that if a straightforward marriage between the goods of one country and those of another could be arranged without a reduction in the current price the tin miner received before he would part with his product, then there would be benefit to both parties. "It is when a direct exchange between the products of two countries is not possible that the barter scheme becomes unwieldy and almost unworkable," he went on. "For instance, Malaya does not want wheat, but by a series of international trading transactions stemming from wheat an end point might be reached where cash

becomes available for the purchase of tin metal. That price may or may not be enough to induce the miner to part with some of his production to the smelter but, from the inquiries which have been made, any final price which may eventually issue from the tortuous preliminary transactions will certainly be well below whatever market prices are current at the time."

**U.S. Capital for Malayan Iron-Ore Enterprise.**—Representatives in Tokyo of Rompin Mining Co., Ltd., which is registered in Kuala Lumpur and which proposes to develop iron ore in Pahang, have now announced that "a substantial proportion" of capital requirements has already been subscribed in the U.S.A. The aim, according to this Tokyo message, is to set up the most modern iron-ore mining enterprise in the Far East. A Rompin company spokesman said that negotiations for more of the needed capital were going on in Washington, where a substantial loan is being sought from the U.S. Development and Aid Fund. The Tokyo report said that American finance had been secured to meet the company's first needs and the overall funds anticipated would cover the cost of port, railway, and mining installations to make certain of regular loading facilities. This railway would have to be cut through jungle and across swamp and plain and would extend for a total of about 50 miles.

**Selangor.**—The Raja Muda of Selangor, who has announced his intention to give up his title, said he bought 64 acres of mining land in Serdang and that operations would begin in July. This venture would be run by European and Chinese executives who would train Malays to take over the administration of the company, he said.

**North Borneo.**—The Japan Federation of the Economic Management Organization has announced it is to send an 11-man survey group to British North Borneo. This team would spend a month exploring the possibility of industrial development, including mineral resources, oil, and natural gas.

**Indonesia.**—A "blueprint" to develop Indonesia's mining resources is to be placed before Parliament for approval, said Colonel Rudy Pirngadie, personal assistant to the Indonesian Minister for Industry, on a visit to Singapore recently. He said he had drawn up a plan to revise the Indonesian-Dutch mining laws.

## JOHANNESBURG

May 29.

**Pneumoconiosis Fund.**—Surplus monies held by the Pneumoconiosis Compensation Fund and generally improved working conditions in the gold mines (resulting in the main from better ventilation conditions) were reflected in the reduced appropriations from working profits for the Fund in the 1958-59 year. The provisional assessment for the 1959-60 year has been reduced to a provisional £800,000 from the previous figure of £2,467,500 and is subject to re-assessment. On the basis of the tonnage milled in the 1958-59 year the benefit of the reduced assessment next year will be from about 6d. to 9d. per ton milled. Whether this benefit will be reflected in dividend declarations is essentially a matter of individual company policy. With their relatively large number of issued shares the benefit to the new gold mines will be negligible per share. In terms of shares issued, therefore, the older mines may find it possible to pass on most at least of the benefit to a relatively more appreciable extent.

**Costs.**—With average working costs on the gold mines continuing to rise the relationship of this trend to that of the gold yield (and in turn the mill grade) is worthy of attention. In the first 1959 quarter working costs per ton milled were reduced in 11 instances, rose in 37 cases, and were unchanged in three cases. Owing to the extension of operations by some new mines partly and the consequent mining of ore more representative of the average mine grade, but more particularly due to selective mining of higher-grade ore to counter higher working costs, working costs per ounce were reduced in 20 cases and rose in 30 cases; the gold yield per ton milled rose in 32 instances and declined in 20. In the first quarter, therefore, economy measures and programmes of re-organization, combined with an increase in the aggregate milling to 16,744,000 tons from 16,540,000, apparently did little more than curb the rate of increase in working costs on individual mines. Among the younger mines Free State Geduld, St. Helena, Western Holdings, Winkelhaak, Buffelsfontein, Loraine, President Brand, and Welkom improved their gold yields in the first quarter and, therefore, must have mined higher-grade ore and/or benefited the grade by intensified waste sorting.

**Shaft-Sinking Practice.**—At the new shafts of the Anglo American Free State mines the



tendency in headframe design is more towards the A-frame for circular shafts. The reasons for this lie in the unstable nature of surface and sub-surface ground over most of the field, due to alternate heaving and subsidence in dry and wet weather, and in the circular shape of the new shafts in the field. The A-frame facilitates the transfer of weight away from the collar of the shaft and a better balance of load in hoisting in that the hoists operate opposed; it also conforms better to the plan-pattern of compartments in a circular shaft.

An innovation in shaft-sinking practice has been introduced in sinking the ventilation component of the No. 3 shaft system of the President Brand mine, which is expected to be completed to a depth of 5,400 ft. in the hoisting component and 5,200 ft. in the ventilation component during the second half of 1960; the two shafts are respectively 24 ft. and 20 ft. diameter inside lining. The innovation consists of a mechanical loader on caterpillar tracks, fitted with a 11½ cu. ft. bucket, which has successfully replaced hand mucking or lashing and apparently the air-operated mechanical grab mounted on the lower deck of a sinking stage as well. One obvious advantage of the track-loader is that it is free-moving even in the confined space of a relatively small ventilation shaft. Another advantage is the lightening of sinking-stage loads.

**Uranium.**—The measure of the country's present capacity to produce uranium oxide is given in the announcement that about 1,000 tons annually could be supplied on relatively short notice. Together with the contract quota of 6,200 tons of uranium oxide supplied to the Combined Development Agency the offer indicates an output capacity of about 7,200 tons in the existing plants. The price for the extra-contract offer is stated to be 8 dollars or about £2.75 per pound of oxide.

**Union Economy.**—Over the first 1959 quarter imports were valued at £118,100,000, exports at £97,400,000, and the adverse trade balance was reduced to £20,700,000; compared with the corresponding 1958 returns of £156,600,000, £101,400,000, and an adverse trade balance of £55,200,000. With the 1957 figures in brackets, individual exports included the following: Mining machinery, £877,747 (£1,127,902); chromite, £607,593 (£842,650); lead concentrate (re-exports) £1,939,191 (£1,872,595); manganese ore, £846,171 (£1,767,155); fire-refined

and blister copper, £1,589,780 (£1,519,718); asbestos, £2,163,454 (£2,456,865); coal (mainly anthracite), £165,734 (£432,406); diamonds, £12,247,684 (£9,096,866); radioactive minerals, £12,481,035 (£14,399,692); bunker coal and ships' stores £1,423,764 (£1,983,592).

**Diamonds.**—In 1958 the demand for gem diamonds represented normal market requirements, while the market for industrial diamonds eased relatively severely for the greater part of the year. Towards the close, however, firmer conditions developed in the gem section and a strong revival in the demand for industrial diamonds was mainly influenced by renewed stockpiling by the U.S. Government. The year was therefore not an easy one for De Beers Consolidated Mines, Ltd., which nevertheless concluded the important transaction of acquiring a 50% interest in Williamson Diamonds, Ltd., Tanganyika. The Williamson mine, which may be expected to produce about £3,000,000 to £3,500,000 of diamonds per year, extends over a large surface area. A small shaft is being sunk to determine payability at depth and to facilitate exploration on the 300 and 800-ft. levels; the results of this will determine the future scale of operations.

Through its Sierra Leone subsidiary De Beers is conducting negotiations with the territory's Government to prevent or minimize the extensive illegal exports of diamonds produced by Africans, which production is very much more than half the total output of the territory. Changes in the existing agreement are felt necessary to place marketing of the African production on a more permanent and stable basis, fully acceptable to the individual African producers. In 1958 the De Beers group purchased Sierra Leone diamonds to the value of £4,600,000. One agreement already reached has been to establish a Government Diamond Office through which the total African production will be marketed.

The group's research laboratory is engaged on extensive tests of both natural and synthetic diamond grit in various grinding operations. Results have shown that natural grit is greatly superior in metallic-bonded grinding wheels and in cutting discs used in the large U.S. concrete road and airfield programmes. The laboratory is also investigating a new natural diamond grit specially prepared for resinoid-bonded wheels. In this research programme the group is co-operating closely with Société Minière du Beceka of the

Belgian Congo. Generally the research programme to expand the use of diamonds in industry has been very much intensified.

The De Beers group expects that 1959 will be a more prosperous year than 1958. In 1958 production by block-caving methods was extended further and the central treatment plant was completed and commissioned. In all, the De Beers mines washed 7,152,763 loads and recovered 968,230 carats or 13.5 per 100 loads at a cost of 69s. a carat. At the new Annex Kleinsee workings, Namaqualand, 385,017 loads were washed and 45,400 carats recovered or 11.8 per 100 loads, at a cost of 129.17s. a carat, which cost is being adversely affected by greater depth of overburden, more difficult mining, and greater distance from the recovery plant than obtained at the closed Kleinsee workings. Outside the so-called lease area, in the Annex Kleinsee zone, prospecting by drilling ahead of trenching proceeded, to determine the depth of overburden and gravels, 56,500 loads derived from prospecting yielding 3,062 carats or 5.4 carats per 100 loads. Operations in the Kaokoveld, South-West Africa, were transferred from the north to the south concession area; over the year 37,851 loads washed yielded 1,450 carats or 3.8 per 100 loads at a cost of 236.83s. a carat against 150.58s. in 1957. In the Lichtenburg district of Western Transvaal prospecting was initiated to determine payability for the purpose of opening the area to private diggers or not.

The diamond prospecting operations in progress in the northern district of the Basutoland Protectorate have continued to yield encouraging results. Revenue is being derived from royalties on diamonds sold, a form of lease rents, and prospecting fees.

**Transvaal.**—Factors that are expected to operate when the current uranium contract of Randfontein Estates expires at the end of 1964 and when competitive conditions will be keen embrace the following: The burden on working costs of cutting connexions with existing shaft systems in order to facilitate uranium-roof development will not have to be provided for; in the upper levels the uranium reefs are heavily faulted and dip steeply, but with depth the dip flattens and the faulting is expected to be less severe, a condition that should reduce costs of stoping. Despite an expected decline of the uranium grade with depth, mining policy will probably be directed towards selective mining of the highest economic grade possible, which

combined with a reduced milling rate and the lower working costs anticipated should enable the mine to compete in the conditions of the post-contract period.

Features of recent operations by Western Reefs Exploration and Development have been the inclusion of 622 claims contiguous with the south-western boundary in the lease area, the definition of an area immediately north of the above 622 claims for which another mining lease will be applied for and where 749,100 tons of payable ore have so far been proved on the Ventersdorp Contact horizon, and defining the Vaal Reef zone within the lease area in the eastern section, where recent operations have shown that values tend to decline towards the southern boundary but that northwards payable values may extend further than previously anticipated. This northern zone near the eastern boundary which is contiguous with Zandpan's southern boundary will be investigated further during the current year.

Western Deep Levels expects the first intersection of Ventersdorp Contact Reef in its No. 2 shaft system at a depth of about 5,720 ft. below surface during the first 1960 quarter and subsequently in the sub-vertical component of the No. 3 System, at a depth of about 6,420 ft., but before this a cross-cut from the vertical component will be driven, probably northwards, to expose the reef. The winze from West Driefontein mine should be fairly well advanced into the Western Deep lease area by about the mid-year in the north-eastern section.

**Orange Free State.**—Welkom has commissioned the main ventilation fans in the Joint No. 3 shaft system in the south-west section of the lease area. Development in country rock has been initiated from the main component of the system.

Western Holdings has initiated reef development in the area of its recently completed No. 3 shaft system in the western section, 500 ft. sampled averaging 2,192 in.-dwt.

Reflecting the influence of recently disclosed high-grade zones, especially in the section south-west of its No. 1 shaft and of the gradual extension of operations in the high-grade southern section of its lease area, the sampled footage values from Free State Geduld backwards over the last four quarters have been as follows: 1,705, 1,255, 1,577, and 1,359 in.-dwt. In the complicated fault-system south-west of No. 1 shaft the twin-haulage on 45 Level intersected the Basal

Reef on the upthrow-side of a reverse fault and 215 ft. sampled in both ends (before the reef was again faulted into the hanging) averaged 9,772 in.-dwt. Since then box-holes have been cut into the hanging and relocated the reef, 25 ft. sampled averaging 4,127 in.-dwt. The lease area can be divided into two sections—the high-grade section south of Nos. 1 and 2 shafts, where bore-holes indicated a discounted grade of about 45 dwt. over 46 in. or about 2,070 in.-dwt. with some much higher-grade zones and the relatively low-grade northern section where bore-holes indicated an average grade of about 5.75 dwt. over 46 in. or about 264.5 in.-dwt. The average mill grade will obviously depend on the tonnages respectively drawn from the two sections. It has been estimated that the high-grade section of the lease area is about 17% of the whole extent of about 6,600 claims. On the basis of both the bore-hole disclosures and the development results reported it is possible to arrive at a range of grade for the lease area of about 16 dwt. to 29 dwt. over a stopping width of 46 in. The yield in the first quarter was 15.4 dwt.; last September's ore reserves averaged 19.8 dwt. over 46.04 in. The complex fault system south of the No. 1 shaft and the major east-west fault and water zone just south of both Nos. 1 and 2 shafts has probably influenced the mine in deciding to sink another shaft from a point about 4,000 ft. south of No. 1 shaft.

St. Helena, in the first 1959 quarter, reported the higher payable footage sampled of 626 in.-dwt., as compared with 596 in.-dwt. in the final 1958 period and 519 in.-dwt. in 1957. The higher values are associated with increased development in the higher-grade north-eastern section. It has been expected that reef values would reflect a higher grade with depth; payability rose to 59% from 57%. The bore-hole grade range for the lease area was 437 in.-dwt. to 510 in.-dwt., with an indicated payability between 50% and 60%. At the end of 1958 the ore reserves of 3,400,000 tons averaged 6.5 dwt. over 55 in. or 357.5 in.-dwt., most of which is in the relatively lower-grade eastern section, namely the sub-outcrop zone. The mine is now sinking its fourth shaft in the east-central section, pre-sinking cementation of the shaft area being conducted. The milling rate is being steadily advanced and improved to 138,300 tons monthly in the first quarter from 134,300 tons in the previous period and 122,300 tons in 1958.

**General.**—The Anglo American Corporation, in line with the greater interest now evident in prospecting for gold, has initiated a number of drilling programmes in the Western Transvaal (in the Ventersdorp-Coligny area to the north of Potchefstroom particularly) and in the Free State (which may be on the eastern rim of the Greater Witwatersrand Basin, between the existing goldfield and Nigel-Kinross). The Corporation's surplus resources place it in a favourable position for exploiting new business opportunities. At the group associate, the Kansanshi copper mine in Northern Rhodesia, an integrated ore treatment process for both oxide and sulphide ores is under investigation and a pilot plant is now being erected, which should be commissioned about the mid-year. Another associate, the South West Africa Co., has initiated output of lead-vanadate concentrates from high-grade deposits in the Berg Aukas area, on which drilling and metallurgical tests are being continued with apparently successful results.

About ten miles north of the Winkelhaak mine in the Kinross area of the Eastern Transvaal is the extensive property of Rand Collieries and Fuel, Ltd. This property is still on a caretaking basis, has been extensively prospected by drilling with satisfactory results, and has two completed shafts. The prospects for the company have undoubtedly been enhanced by the operations of the Union Corporation group and the value of its assets consolidated by the extension of mining to the south, on the very doorstep of which it figuratively stands, as it were, hat-in-hand and coal sack trailing behind it.

**South-West Africa.**—The Consolidated Diamond Mines of South West Africa, Ltd., has doubled and electrified its coastal rail-line along which the products from field screening plants are transferred to the main treatment plant. There the new continuous grease-belt recovery plant and diamond sorting house are in the final stages of erection. A new field screening and crushing plant, erected specifically to handle hard conglomerates and cemented gravels, has been commissioned in one section. In 1958 prospecting operations declined below the previous year's levels, 35,169 cu. m. in 7,000 m. of trenching having been sampled with about 90,000 carats of diamonds added to estimated reserves after allowing for the year's depletion, respectively, as compared

with 61,318 cu. m. sampled, 25,475 m. trenched, and the addition of a net 400,000 carats to the estimated reserves in 1957.

**Cape Province.**—Associated Manganese Mines of South Africa, Ltd., has commissioned one new mine for production and a second is nearing the production stage. These mines have been established principally to supply ore to Feralloys, Ltd., in Natal, where the first two ferro-manganese furnaces will be commissioned in the near future. The company has purchased the mineral rights over an additional 8,453 acres in which leases were previously held. Exploratory operations were continued. In 1958, 237,179 sh. tons of ore were railed, against 254,941 in 1957, to export markets. At writing, the recovery in the external steel-making indus-

tries has not been reflected in improved demands and prices for manganese ore.

#### **Mining Journal Annual Review, 1959 :**

Technical and Economic Progress Throughout the World. Paper Covers, quarto, 348 pages, illustrated. Price 21s. London : *The Mining Journal*.

This annual Survey gives, as usual, an authoritative review of technical and economic progress in world mining. Recent developments in exploration, mining techniques, ore treatment, and metallurgy are dealt with at length, while current trends in the industry are competently reviewed. It is annual reference work that is always welcomed and the current issue is well up to standard.

## Trade Notes

Brief description of  
developments of  
interest to the  
mining engineer

### **New Venture**

The establishment of an Air Power Division was announced at a Press conference held in London last month by **Joy-Sullivan, Ltd.**, of 7, Harley Street, London, W. 1. The company, which is a wholly-owned subsidiary of the Joy Manufacturing Co., of Pittsburg, Pennsylvania, were moved to take this step when they found themselves confronted with a cessation of buying by the National Coal Board of those mining-machinery products on which their works at Greenock and Dronfield are largely engaged. It was pointed out that the parent company's range of product covers : Coal-mining machinery, a range of compressors and compressed-air tools and machinery for the civil engineering, quarrying, and metal-mining industries, exploratory, seismic, blast-hole, and water-well drilling rigs, both rotary and percussion, and large oil-well drilling-rig equipment, conveying and materials-handling machinery, and specialized electrical equipment. A detailed survey of the potentials of these groups, with particular

bearing on the export market, was carried out by the British company and as a result it was considered that compressors and compressed-air driven equipment offered the best opportunity.

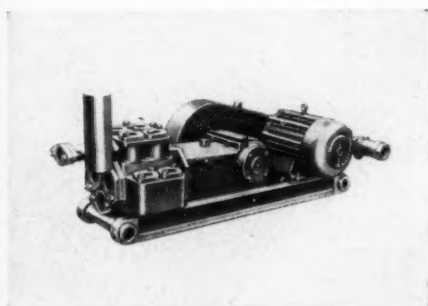
The new division of the company will be in a position to supply the following products : In the compressor range, oil-flooded rotary vane type portable units and a range of two-stage, heavy-duty, water-cooled stationary and air-cooled semi-portable compressors which can also be adapted for low-pressure air supply. Each of these units can be supplied with a variety of power sources with a full range of ancillary equipment. The tools available to begin with include two hand-held rock-drills of high performance in the 35-lb. and 50-lb. class and an air-leg rock drill, the JAL. 47, with a high footage rating already obtained. Added to these are the products already being manufactured for the mining industry—namely, two types of air-powered shovel loaders with capacities up to 3 tons a minute, scraper-slide loaders, complete with double-drum haulage



units, four types of air-driven, single-drum, multi-purpose hoists, and wagon-drill mountings and feeds and drill jumbos for the larger drivers. In a subsequent issue some further particulars of the compressors and rock-drills will be given.

## Two New Mining Pumps

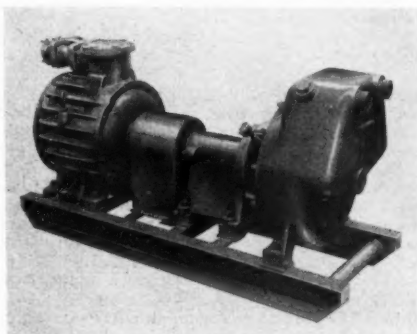
Some particulars have been made available of two new mining pumps. In one, that made by **Joseph Evans and Sons (Wolverhampton), Ltd.**, of Wolverhampton, the makers refer to the difficulty in dealing with small quantities of water which accumulate underground and certain gritty matter in suspension. It was with these problems in mind that the pump was designed. It is a totally enclosed duplex piston type. The crankcase and skid-type base are of integral fabricated steel construction, combining rigidity and low weight. The lubrication system to the crankcase is by splash and is efficient with either direction of rotation and with the pump at a slight inclination from the horizontal. The crankshaft runs in roller bearings and the cross-heads have renewable guides. The crankcase has a suitable inspection cover and is sealed against ingress of dirt and dust. The liquid end is of the side-pot type with individual valve boxes having separate covers. Valves can either be of the ball or rubber-sealed disc type. The pump piston has special Fluon sealing rings to reduce heat generated when working on snore to a minimum. Removable liners are provided and materials of construction can be adapted to suit specific requirements. A simple chain transmission drive between the motor and pump crankcase enclosed in a heavy-gauge oil bath case is used.



**Joseph Evans Mine Pump.**

The motor is mounted on the pump base at the back of the crankcase. Two sizes are at present available and each can be fitted with three different bore interchangeable liners. The pumps are of relatively short stroke so that internal gearing in the crankcase is dispensed with whilst retaining the low piston speed. The capacity range is from 20 gal. to 80 gal. per min. and the maximum head 460 ft.

The other pump has also been designed for general underground work and is a self-priming centrifugal unit which will deliver up to 90 g.p.m. and work against a static suction lift of 25 ft. with a maximum head of 125 ft. passing solids of  $\frac{5}{16}$  in. size. Materials are available to withstand those waters containing corrosive acids. It is made by **Pegson, Ltd.**, of Coalville, Leicester, and incorporates the Pegson Marlow diffuser feature which assures self-priming without liquid recirculation or auxiliary mechanisms.



**Pegson Centrifugal Pump.**

The pump has relatively large clearances to ensure that full priming efficiency is maintained even when excessive abrasion is encountered and the impeller and diffuser are the only two parts subject to abrasive wear. There are no internal valves, no pressure-relief valves, and no foot valves are required. A soft-packed stuffing box or alternatively a mechanical shaft seal prevents air being drawn into the pump even on the highest suction lifts and oil seals safeguard the grease-lubricated taper roller bearings against dust and grit. The pump shaft which is protected by a sleeve of ample proportions for all duty conditions and is not subject to hydraulic bending loads. It can be supplied with or without power unit.

## Personal

G. L. BATEMAN has relinquished the managing directorship of E. L. Bateman, Ltd., in favour of Mr. E. L. BATEMAN, but he remains chairman of the company.

J. R. BROWN is home from Nigeria.

W. J. BUSSCHAU has been appointed a joint general manager of New Consolidated Gold Fields, Ltd.

G. J. COSLETT is now in Malaya.

D. A. DAVIS has been appointed managing director of Anglo Colonial Territories, Ltd.

W. E. HOSKING has been appointed a director of Kinta Tin Mines, Ltd.

L. C. BRODIE HILL, who recently succeeded Mr. F. F. ESPIE in the Western Mining Corporation group has left West Australia for a tour of Sweden and North America.

C. P. A. LOUWRENS has been appointed a consulting mechanical engineer to the Anglo American Corporation.

A. A. VON MALTITZ has been appointed managing director of the Anglo-Transvaal Consolidated Investment Co., Ltd., in succession to Mr. B. L. BERNSTEIN.

W. MARTIN has been appointed a consulting mechanical engineer to the Anglo American Corporation.

K. SHAW has left for Nigeria.

ROBERT PATTISON FARQUHAR PRAIN, who died in America on May 11, aged 87, was trained at Freiberg. For many years engaged in mining practice in Chile he later took up consulting work. He had relinquished his practice as recently as 1952. Mr. Prain was a Member of the Institution of Mining and Metallurgy.

LAURENCE CARR HILL, who died suddenly on May 4, aged 68, was at the Royal School of Mines until 1912, where he gained the Brough Medal. He joined the Rio Tinto Company, with which he spent the whole of his professional career, in later years as Technical Adviser in London. In the 1914-18 war he served with the Royal Engineers in the 174th and 177th Tunnelling Companies, becoming, in 1916, Assistant Controller of Mines, 3rd Army; for his services he received both the D.S.O. and M.C. and four Mentions in Despatches. During World War II he was Chief Engineer, Malta, from 1943 to 1944. Col. Hill was a Member of the Institution of Mining and Metallurgy, of which he was president in the 1950-51 session.

GEORGE CHARLES HOLLIS, died on May 25, aged 78. Mr. Hollis was trained in engineering at University College, London, and went on to the Camborne School of Mines, taking his Diploma in 1904. After a short spell in Italy he went to Portugal for Mason and Barry, Ltd., but in 1909 he left for Mexico where he worked for several gold-mining companies. At the outbreak of war in 1914 Mr. Hollis came back to this country to join the Forces, serving until 1919 when he was discharged with the rank of captain. There followed periods of work in Canada, the United Kingdom, Cyprus, and the United States, until in 1932 he returned to general engineering practice. However, in the following year Mr. Hollis went back to Italy for two years before taking up general inspection work, in the course of which he visited Western Australia and Central America. Mr. Hollis, who had been in retirement for some years, was a Member of the Institution of Mining and Metallurgy.

## Metal Markets

### During May<sup>1</sup>

**Copper.**—The background to the copper market in May has been dominated by the same feature as influenced the tone of the market in April—namely, the threat of a strike at American mines and smelters on the expiry of the current labour contract at the end of June. Current thinking ties the possibilities of strikes in the copper and steel industries fairly closely together. The glare of publicity focused on steel industry negotiations in the U.S.A. does not illuminate any very conciliatory attitude amongst the conflicting parties, so that perhaps the odds are rather in favour of a copper strike than otherwise. Certainly, this reasoning would appear to underlie the inherent strength of copper in London,<sup>2</sup> in the face of continued evidence, both in the form of statistics and demand, that European consumption is not at its best levels; is, in fact, running at a rather worse rate than a year ago. Global statistics certainly show an overall improvement in consumer offtake and a decline in total producers' stocks, but this is largely due to the anticipatory buying in the U.S.A.

Nevertheless, there is something to be said for the argument that a greater proportion than is realized of the demand now being received right along the copper line in the U.S.A.—down to actual consumer appliances and electrical industry items—is attributable to genuine consumer demand. If this argument is right, of course, and a strike against the producers does actually materialize, then there will be a considerable squeeze on copper supplies in the third quarter.

Another topic, which is not new in itself, but which has attained considerable importance again in May, is the question of copper pricing methods. Ever since the Rhodesian Selection Trust fixed-price scheme was abandoned, producers, far from being disheartened, have been investigating other approaches to the question of finding a method of pricing copper which would make day to day movements less volatile than those on the Metal Exchange. Indeed, there is probably a greater degree of unanimity on this subject among producers now, than at the time that the R.S.T. group made its lone effort. Consumers, however, while equally willing to eliminate day to day fluctuations, are most unwilling to forego the opportunity to hedge which the existence of the Metal Exchange offers them. Meanwhile, it has been noticeable increasingly in recent months that, for the first time in history, developments on the Commodity Exchange in New York have seriously affected the tone of London, owing to the much greater tonnages currently being traded there.

Copper consumption in the U.K. in March was 47,431 tons, bringing the first quarter to 148,703 tons, against 161,091 tons in the same period of 1958. Wire output showed a drop of 10,000 tons in the period. Output of primary refined was 7,727 tons and of secondary refined 7,990 tons. Stocks of refined copper rose to 62,200 tons, with blister up to 10,746 tons.

**Tin.**—The only feature of interest in the tin market<sup>2</sup> in the past month was the announcement very early in June, of the outcome of the latest

<sup>1</sup> Recent prices, pp. 328, 368.

<sup>2</sup> See Table, p. 368.

meeting of the International Tin Council. This was a decision to make a further small increase in the total permissible export quota for the third quarter of this year, to 25,000 tons. Although there had been talk beforehand of the possible adverse effect on the market of any increase in the third quarter quota, it is probable that the increase referred to in these circumstances was a more substantial one, such as some of the more extreme producing countries are thought to have desired. In fact, the quota still leaves an apparent global deficit for the remainder of this year, even taking into account the fact that an arrangement was made whereby the Buffer Stock Manager would help with the disposal of the U.K. Government's surplus 2,500 tons. The new quota prudently takes account of the fact that Russia is still entitled in terms of her arrangement with the Tin Council, to export the greater part of 13,500 tons in the coming six months.

U.K. March consumption was 1,773 tons, with the first quarter comparing well with the same period of 1958 at 5,156 tons. March output was 1,575 tons and stocks were 13,214 tons.

**Lead.**—Apart from a decrease in U.S. producers' stocks for the first time in many months, which was learned during May, the market<sup>1</sup> has presented a picture of unrelieved gloom throughout the month. The seriousness of the basic position which this reflects may be judged from the fact that the United Nations meetings on price stabilization in New York, to which attention was drawn in last month's report, exceeded all hopes in its achievements, even though these are merely the reaching of agreement on the desirability of producing companies instituting voluntary cuts in production to attempt to ameliorate the relationship of supply to demand.

U.K. March consumption was 26,691 tons, with the first quarter of the year comparing poorly with the same period of 1958 at 81,531 tons. March production was 6,551 tons and stocks were slightly up at 42,761 tons.

**Zinc.**—The appearance of the zinc market<sup>1</sup> has been rather brighter lately, especially since the unexpected degree of success attained at the U.N.-sponsored stabilization conference in New York. Demand for high-grade metal—especially in the U.S.A.—has not been bad, although there is still more than enough metal about in the world. Provided there is no U.S. steel strike, which would affect galvanized sheet output there, the prospects for a modest further improvement are fair.

U.K. March consumption was 27,243 tons, and first quarter total 80,408 tons, better than 1958. March output was 7,012 tons and stocks 38,457 tons.

**Iron and Steel.**—The most notable feature affecting the U.K. iron and steel industry recently was the reduction in home prices. Announcing the changes, the Iron and Steel Board said that since the last general revision of prices in March, 1958, there had been several changes on production costs. While the cost of some imported raw materials had fallen, other costs, notably railway rates and wages, had risen. However, the Board said that there had, on balance, been a reduction but this left out of account the fact that the fall in the volume of orders has led to many mills being operated at below their most economical level. On the assumption that savings could be achieved both in mill costs and in transport if the size of individual orders were increased, the Board decided to reduce the

maximum prices of steel in quantities of 10 tons and upwards (large quantities for certain products) ordered to one specification for one delivery to one destination. The reductions are of the order of 2% on the previous levels. The Board believes that the reductions for larger quantities should help to strengthen the competitive position at home and abroad of those consumers who take advantage of them. No further changes in prices determined by the Board are in prospect.

Although the extent of the reductions is modest, the cuts have nevertheless been favourably received, and as some quarters have pointed out the industry is following the American practice of allowing discounts for larger lots. The crux of the industry's present difficulties is that many consumers, who have for many months been drastically reducing their large stocks, have only been ordering steel on a hand to mouth basis which has, as the Board stated, led to many mills being operated below their most economical level.

**Iron Ore.**—Steel production in Britain has already recovered a little—although operations are still only around 80% of capacity—but the increase has mainly favoured scrap steel rather than iron ore. As a result the iron-ore situation remains featureless and no significant improvement in the outlook for ore is expected until the industry manages to reduce its large reserves of scrap. Imports of iron ore continue at a reduced rate and in the first four months of this year they declined by almost 20% from 4,380,000 tons in the January-April period of 1958.

**Aluminium.**—As was the case in April, market interest during May has been centred on imports of aluminium into the United Kingdom. While it has been reported that the U.S.A. is not too anxious to send metal here because of the threat of a strike in that country arrivals here totalled almost 9,000 tons during the first three months of this year. However, the strike threat may possibly have slowed down deliveries to this side of the Atlantic during April and May and it might be that the reports refer to these months. Russian arrivals in the first quarter amounted to almost 3,000 tons averaging about £169 a ton c.i.f. However, this is not the cheapest metal offering. When France is in the market—which she does not seem to be at present—she may offer at as low as £167 a ton c.i.f., while Eastern European satellite countries offer at around £170 a ton.

As far as metal from U.S. producers is concerned it is not clear as to whether it is being sold on the market or whether—and this seems more likely—the bulk of it is going to U.S. affiliates here—i.e., T.I. Aluminium and B.A.

Canadian metal—the bulk of U.K. imports still—is quoted in the U.K. at £180 a ton.

**Antimony.**—During April there were no imports of antimony ore into the U.K. Metal exports totalled almost 123 tons, bringing total exports for the first four months of the year to 234 tons. May saw little change in the overall market situation and U.K. regulus remains quoted at £197 10s. per ton delivered for 99.6% material.

**Arsenic.**—This market is dull in the extreme and there does not seem much hope of any significant alteration in the foreseeable future.

The U.K. metal price continues to be quoted at £400 a ton.

**Bismuth.**—There are no signs of any sharp

<sup>1</sup> See Table, p. 368.

change in interest in this metal and business continues to pass at normal levels. Metal in the U.K. is quoted at 16s. per lb.

**Cobalt.**—This market is still in the doldrums and there seems little likelihood of improvement in the near future. Metal is still quoted at 14s. in the U.K.

**Cadmium.**—Consumption of cadmium in March continued at a fairly good rate and for the first three quarters of the year totalled 287 tons as compared with 261 tons for the comparable period the previous year. However, this statistical ray of light does not seem to have had any improving influence on prices and metal is still quoted at 9s. per lb.

**Chromium.**—Little of interest came to light in May and the price of chromium metal is still quoted in the U.K. at between 6s. 11d. and 7s. 4d. per lb.

**Tantalum.**—Since the fall in prices last month there has been very little worthy of any comment in this market. Offers still remain well above consumer buying demand and the ore price is quoted nominally at 550s.-600s. per unit.

**Platinum.**—While the main sellers of platinum have held their price at £28 10s. per troy oz. during the past month, material on the open market has been rising during May from a level of £25 10s.-£26 10s. to £26-£27 per troy oz. At the end of the month open-market metal prices rose further and are now quoted at £27-£27 15s. an oz. The latest rise followed a similar move in the U.S.A.

**Iridium.**—The price of this metal remained quite stable during May and continues to be quoted at £24-£24 15s. per oz. nominally.

**Palladium.**—There has been no alteration in the tempo of this market recently and metal is still quoted at £7 5s. an oz.

**Osmium.**—There has been no change in this

market during the past month and the quotation for osmium in the U.K. remains at £23-£32 5s. per troy oz.

**Tellurium.**—A large supplier in the U.K. has reduced its price of tellurium and this metal is now quoted at 14s. per lb. It is worth noting, however, that in the U.S.A. a leading producer has recently raised its price!

**Tungsten.**—May saw tungsten prices move up, hesitate slightly, then move up again into the three-figure range. The important factor behind these upward movements is undoubtedly the severe stock reductions which have taken place in Europe in the past few months. However, with prices as high as 103s. 6d. per unit being mentioned, there is a fairly strong possibility that many people will lose interest rather quickly.

**Nickel.**—Nickel continues to be held at £600 a ton, with little prospect of any alteration. Supplies continue in excess of demand, a situation which does not look like changing for some time to come.

**Chrome Ore.**—The barter deal of Transvaal chrome ore for U.S. wheat which, as noted in a previous report, appeared to be running into difficulties, was successfully concluded in May. Rhodesian material in the U.K. is quoted at £15 15s. a ton for metallurgical grade.

**Molybdenum.**—There were no alterations to the price of molybdenite during the month of May—8s. 11d. per lb. of metal f.o.b.

**Manganese Ore.**—While Indian manganese ore freight rates have been increased by 5s. a ton as from May 15 the c.i.f. price has not been increased by a proportionate amount. This is mainly due to the lower offering prices in India. The c.i.f. price can only be quoted nominally at present and remains at 70d. per unit for 46-48% material.

### Tin, Copper, Lead, and Zinc Markets

Tin, minimum 99.75%; Copper, electro; Lead, minimum 99.75%; and Zinc, minimum 98%, per ton.

Date	Tin		Copper		Lead		Zinc	
	Settlement	3 Months	Spot	3 Months	Spot	3 Months	Spot	3 Months
May. 11	£ 783 5	£ 784 5	£ 233 17½	£ 234 12½	£ 72 2½	£ 72 12½	£ 77 12½	£ 76 7½
12	784 0	784 5	234 12½	235 12½	72 18½	73 1½	78 5	76 2½
13	785 0	785 15	235 12½	236 12½	71 11½	71 17½	77 11½	75 13½
14	784 10	785 0	233 7½	234 7½	71 1½	72 1½	77 12½	75 17½
15	784 10	784 15	234 12½	235 17½	71 13½	72 6½	78 2½	76 7½
18	—	—	—	—	—	—	—	—
19	784 0	784 5	236 7½	237 12½	71 8½	72 3½	78 2½	76 2½
20	784 10	784 15	237 5	238 2½	71 6½	72 1½	78 2½	76 2½
21	785 0	785 5	238 2½	237 17½	70 11½	71 3½	77 11½	75 11½
22	785 10	785 5	241 7½	239 17½	70 10	71 2½	78 6½	76 8½
25	785 10	785 5	244 2½	241 17½	70 6½	71 1½	79 17½	77 12½
26	785 0	784 15	238 12½	237 2½	70 2½	71 1½	78 12½	76 12½
27	785 10	784 15	240 17½	239 12½	69 16½	71 1½	79 5	77 6½
28	785 0	784 5	241 2½	240 7½	70 6½	71 11½	78 17½	77 10
29	785 10	784 10	241 2½	239 17½	69 18½	71 13½	77 2½	76 12½
June 1	786 0	785 15	240 17½	240 7½	70 7½	71 11½	78 0	76 17½
2	786 0	786 5	242 5	241 2½	70 7½	71 11½	78 6½	77 3½
3	787 10	788 5	239 2½	238 12½	70 2½	71 7½	77 12½	76 12½
4	788 0	790 5	240 7½	239 2½	69 17½	71 8½	77 11½	76 16½
5	786 10	787 15	237 7½	236 7½	69 15	71 2½	77 7½	76 10
8	787 10	788 15	239 0	237 17½	69 17½	71 7½	77 13½	76 17½
9	789 10	790 5	234 17½	233 12½	69 12½	71 2½	77 3½	76 8½
10	789 0	791 0	235 12½	234 7½	69 6½	71 2½	77 11½	76 17½



## Statistics

## TRANSVAAL AND O.F.S. GOLD OUTPUTS

	APRIL		MAY	
	Treated Tons.	Yield Oz.*	Treated Tons.	Yield Oz.†
Blyvooruitzicht .....	126,000	80,338	132,000	83,816
Brakpan .....	136,000	16,976	142,000	16,915
Buffelsfontein† .....	137,000	49,078	138,000	51,591
City Deep .....	113,000	23,823	116,000	24,133
Cons. Main Reef .....	120,000	20,713	123,000	19,335
Crown Mines .....	219,000	35,511	230,000	35,487
Daggafontein .....	244,000	49,373	244,000	49,055
Doomfontein† .....	92,000	37,881	92,000	37,790
D'r'b'n Roodepoort Deep .....	188,000	35,069	193,000	35,927
East Champ D'Or† .....	12,000	219	12,500	282
East Daggafontein .....	101,500	16,853	102,500	16,992
East Geduld .....	138,000	41,412	142,000	42,247
East Rand P.M. ....	223,000	59,669	229,000	57,973
Eastern Transvaal Consol .....	19,000	6,164	18,700	5,999
Elliot† .....	31,500	7,348	32,000	7,400
Freddies Consol. ....	58,000	14,249	58,000	14,147
Free State Geduld .....	82,500	64,752	83,500	65,966
Geduld .....	73,000	15,590	75,000	13,988
Government G.M. Areas† .....	52,000	10,783	51,000	10,603
Grootvlei Proprietary .....	205,000	43,352	215,000	45,498
Harmony Gold Mining .....	125,000	49,185	133,000	51,948
Hartebeestfontein† .....	88,000	47,960	89,000	48,505
Libanon .....	101,000	24,104	105,000	24,681
Loraine .....	78,000	15,210	78,000	15,210
Luijpaards Vlei† .....	125,000	14,289	100,000	11,597
Marievale Consolidated .....	93,000	22,968	95,000	23,221
Merriespruit .....	135,000	13,520	136,000	13,655
Modderfontein East .....	84,000	11,012	83,000	10,584
New Kleinfontein .....	9,700	971	11,200	1,198
President Brand .....	107,000	86,670	110,000	88,319
President Steyn .....	105,000	40,473	107,000	41,200
Rand Leases .....	188,000	28,294	191,000	28,393
Randfontein† .....	190,000	13,667	200,000	14,265
Rietfontein Consolidated .....	16,000	4,134	16,000	4,137
Robinson Deep .....	57,500	12,368	55,000	12,292
Rose Deep .....	40,000	5,027	43,000	5,263
St. Helena Gold Mines .....	150,000	44,991	150,000	45,062
Simmer and Jack .....	91,000	16,247	88,000	16,256
S. African Land and Ex. S. Roodepoort M.R. ....	97,000	20,371	99,000	20,765
Spaarwater Gold .....	30,000	7,299	29,000	7,011
Springs .....	11,000	3,556	11,000	3,429
Stilfontein Gold Mining† .....	105,000	14,280	105,000	14,228
Sub Nigel .....	143,000	69,926	145,000	69,744
Transvaal G.M. Estates .....	66,500	15,830	66,500	15,933
Vaal Reefs† .....	6,200	1,873	6,600	1,869
Van Dyk Consolidated .....	87,500	39,594	90,500	40,725
Venterspost Gold .....	79,000	14,592	77,000	14,265
Village Main Reef .....	130,000	31,857	130,000	31,883
Virginia O.F.S.† .....	25,000	4,032	26,000	4,680
Vlakfontein .....	127,000	31,433	134,000	31,996
Vogelstruisbult† .....	51,000	18,358	51,000	18,231
Vogelstruisbult† .....	96,000	21,293	91,000	20,276
Welkom Gold Mining .....	100,000	30,629	101,000	30,754
West Driefontein† .....	92,000	84,654	95,000	86,713
West Rand Consol.† .....	211,000	21,081	218,000	22,741
Western Holdings .....	117,000	70,770	126,000	76,545
Western Reefs .....	131,000	34,082	139,000	36,018
Winkelhaak .....	74,000	18,197	78,000	19,305
Witwatersrand Nigel....	18,200	4,390	18,200	4,386

† 240s. Id.

\* 240s. 9d.

‡ Gold and Uranium.

## COST AND PROFIT IN THE UNION

	Tons milled	Yield per ton	Work's cost per ton	Work's profit per ton	Total working profit
		s. d.	s. d.	s. d.	£
Mar., 1958 .....	15,806,300	64 10	46 6	18 4	23,170,987
April .....	—	—	—	—	—
May .....	—	—	—	—	—
June* .....	16,435,500	64 9	46 6	18 3	24,358,945
July .....	—	—	—	—	—
August .....	—	—	—	—	—
Sept. ....	16,700,400	65 10	46 9	19 1	25,633,898
Oct. ....	—	—	—	—	—
Nov. ....	—	—	—	—	—
Dec. ....	16,540,150	67 7	47 10	19 9	25,934,441
Jan., 1959 .....	—	—	—	—	—
Feb. ....	—	—	—	—	—
Mar. ....	16,743,500	68 0	45 4	22 8	25,934,881

\* 3 Months.

## PRODUCTION OF GOLD IN SOUTH AFRICA

	RAND AND O.F.S.	OUTSIDE	TOTAL
	Oz.	Oz.	Oz.
May, 1958 .....	1,435,960	36,494	1,472,454
June .....	1,408,384	39,187	1,447,571
July .....	1,456,925	42,312	1,499,237
August .....	1,463,259	36,413	1,499,672
September .....	1,465,627	36,799	1,502,426
October .....	1,516,701	44,025	1,560,726
November .....	1,484,844	32,349	1,517,193
December .....	1,480,525	40,372	1,520,895
January, 1959 .....	1,506,670	39,515	1,546,187
February .....	1,472,060	34,618	1,506,708
March .....	1,501,196	32,271	1,533,467
April .....	1,616,891	36,815	1,653,706

## NATIVES EMPLOYED IN THE SOUTH AFRICAN MINES

	GOLD MINES	COAL MINES	TOTAL
August 31, 1958 .....	334,815	31,924	366,739
September 30 .....	339,380	31,978	365,358
October 31 .....	335,003	32,657	367,660
November 30 .....	332,443	32,851	365,294
December 31 .....	329,234	32,946	362,180
January 31, 1959 .....	350,656	—	—
February 28 .....	396,217	33,859	430,076
March 31 .....	379,257	32,082	412,239
April 30 .....	383,710	33,081	416,791

## MISCELLANEOUS METAL OUTPUTS

	4-Week Period		
	To May 2		
	Tons Ore	Lead Concns. tons	Zinc Concns. tons
Broken Hill South .....	28,600	4,524	4,945
Electrolytic Zinc .....	13,226	728	4,004
Lake George .....	13,162	1,089	2,022
Mount Isa Mines** .....	60,202	3,200†	1,806
New Broken Hill .....	64,700	10,063	12,737
North Broken Hill .....	26,422	5,005	5,253
Zinc Corp. ....	58,040	9,578	10,165
Rhodesia Broken Hill* .....	—	—	—

\* 3 Mths.

\*\* Copper 4,165 tons.

† Metal.

## RHODESIAN GOLD OUTPUTS

	APRIL		MAY	
	Tons	Oz.	Tons	Oz.
Cam and Motor .....	31,602	—	32,120	—
Falcon Mines .....	20,000	3,778	20,000	3,721
Globe and Phoenix .....	6,000	3,483	6,000	3,100
Motapa Gold Mining .....	21,600	1,613	—	—
Mazoe .....	3,014	—	2,738	—
Coronation Syndicate .....	12,400	—	12,260	—
Phoenix Prince* .....	—	—	—	—

\* 3 Months.

## WEST AFRICAN GOLD OUTPUTS

	APRIL		MAY	
	Tons	Oz.	Tons	Oz.
Amalgamated Banket ....	62,359	14,750	67,408	15,619
Ariston Gold Mines .....	41,640	12,584	40,000	12,774
Ashanti Goldfields .....	34,000	27,000	33,500	26,750
Bibiani .....	33,500	7,200	33,500	7,200
Brenang .....	—	5,644	—	3,973
Ghana Main Reef .....	12,547	4,328	11,971	4,302
Konongo .....	6,560	3,970	6,530	3,865
Lyndhurst .....	—	—	—	—

## PRODUCTION OF GOLD AND SILVER IN RHODESIA

	1958		1959	
	Gold (oz.)	Silver (oz.)	Gold (oz.)	Silver (oz.)
January .....	44,305	46,553	46,489	18,077
February .....	43,591	21,313	43,366	19,806
March .....	43,830	8,179	—	—
April .....	46,587	22,573	—	—
May .....	46,015	19,937	—	—
June .....	46,453	20,105	—	—
July .....	44,244	19,170	—	—
August .....	47,484	20,549	—	—
September .....	48,295	21,141	—	—
October .....	46,311	6,342	—	—
November .....	47,904	16,435	—	—
December .....	48,888	30,724	—	—

## WESTRALIAN GOLD PRODUCTION

	1957	1958	1959
	Oz.	Oz.	Oz.
January .....	106,722	66,562	63,924
February .....	64,949	65,965	65,035
March .....	67,121	65,420	65,408
April .....	66,435	60,855	62,686
May .....	64,886	64,196	—
June .....	65,142	67,929	—
July .....	74,420	81,106	—
August .....	75,727	68,610	—
September .....	64,422	68,744	—
October .....	64,524	70,128	—
November .....	65,700	67,562	—
December .....	66,562	120,106	—
Total .....	846,610	867,187	—

## AUSTRALIAN GOLD OUTPUTS

	4-WEEK PERIOD			
	To APR. 14		To MAY 12	
	Tons	Oz.	Tons	Oz.
Central Norseman .....	14,011	8,572	—	—
Cresus Proprietary .....	—	—	—	—
Gold Mines of Kalgoorlie .....	36,918	8,871	—	—
Golden Horse Shoe* .....	—	—	—	—
Gt. Boulder Gold Mines* .....	—	—	—	—
Gt. Western Consolidated .....	32,834	5,633	—	—
Hill 50* .....	—	—	—	—
Kalgoorlie Ore Treatment .....	—	—	—	—
Lake View and Star* .....	—	—	—	—
Moonlight Wiluna* .....	—	—	—	—
Morning Star (G.M.A.) .....	—	—	—	—
Mount Ida* .....	—	—	—	—
New Coolgardie .....	—	—	—	—
North Kalgoorlie .....	13,175	3,155	—	—
Sons of Gwalia .....	9,812	2,123	9,964	2,434
Mount Morgan .....	—	—	—	5,150

\* 3 Months

## ONTARIO GOLD AND SILVER OUTPUT

	Tons Milled	Gold Oz.	Silver Oz.	Value Canad'n \$
December, 1957 ..	750,537	215,462	44,230	7,494,289
January, 1958 ..	779,128	219,502	31,562	7,462,598
February .....	727,170	210,646	35,370	7,248,333
March .....	807,458	229,361	38,323	7,873,264
April .....	785,264	228,590	35,712	7,789,644
May .....	801,102	228,123	37,535	7,745,425
June .....	775,384	228,960	42,275	7,740,144
July .....	750,410	218,126	38,940	7,355,406
August .....	740,459	202,798	31,543	7,006,517
September .....	771,115	209,006	34,914	7,178,218
October .....	801,965	230,251	35,027	7,842,435
November .....	785,065	219,351	30,989	7,490,004
December .....	787,573	227,656	41,277	7,700,672
January, 1959 ..	799,178	227,981	32,976	7,798,523
February .....	727,843	211,648	29,849	7,317,564
March .....	807,962	223,728	33,045	7,616,425

## MISCELLANEOUS GOLD AND SILVER OUTPUTS

	APR.		MAY	
	Tons	Oz.	Tons	Oz.
British Guiana Cons. ....	—	—	—	—
Central Victoria Dredging ..	—	—	—	—
Clutha River .....	—	331	—	434
Emperor Mines (Fiji)* .....	—	—	—	—
Frontino Gold (Colombia) ..	—	—	—	—
Geita Gold (Tanganyika) ..	—	—	—	—
Harrierville (Aust.) .....	—	—	—	—
Lampa (Peru)† .....	—	35,400	—	—
Loloma (Fiji)* .....	—	—	—	—
New Guinea Goldfields ..	3,877	1,266	—	—
St. John d'el Rey (Brazil) ..	—	—	—	—
Yukon Consol. ....	—	—	—	\$76,000

\* 3 Months. † Oz. Silver: Copper, 61:85 tons.

## OUTPUTS OF MALAYAN TIN COMPANIES IN LONG TONS OF CONCENTRATES

	MAR.	APR.	MAY
Ampat Tin .....	50	51	46
Austral Amalgamated .....	—	—	—
Ayer Hitam .....	130*	—	—
Batu Selangor .....	—	—	—
Berjuntai .....	112	92½	119
Chenderiang .....	21*	—	—
Gopeng Consolidated .....	109*	—	—
Hongkong Tin .....	41*	—	—
Idris Hydraulic .....	19*	—	—
Ipoah .....	464*	—	—
Jelapang Tin .....	—	—	—
Kampong Lanjut .....	87½	62½	44½
Kamunting .....	92	122	118½
Kent (F.M.S.) .....	34*	—	—
Kepong .....	—	—	—
Killinghall .....	534*	—	—
Kinta Kellas .....	—	—	—
Kinta Tin Mines .....	59*	—	—
Klang River .....	—	—	—
Kramat .....	—	—	—
Kuala Kampar .....	110	115½	140
Kuala Lumpur .....	—	—	—
Kuchai .....	—	—	—
Lahat Mines .....	—	—	—
Larut .....	—	—	—
Lower Perak .....	46½	55	42½
Malayan .....	263*	—	—
Malaysiam .....	—	—	—
Pacific Tin Consolidated ..	—	—	—
Pahang Consolidated .....	372*	—	—
Pengkalan .....	58*	—	—
Petaling Tin .....	334*	—	—
Puket .....	—	—	—
Rahman Hydraulic .....	68*	—	—
Rambutan .....	20*	—	—
Rantau .....	23	25	15½
Rawang Concessions .....	—	—	—
Rawang Tin Fields .....	—	—	—
Renong .....	112*	—	—
Selayang .....	35*	—	—
Siamese Tin Syndicate (Malaya) ..	3	16	17
Southern Kinta .....	217	247	323
Southern Malayan .....	411*	—	—
Southern Tronoh .....	—	—	—
Sungei Besi .....	142*	—	—
Sungei Kinta .....	34½*	—	—
Sungei Way .....	182½*	—	—
Taipang Consolidated .....	46	39	37
Tambah .....	—	—	—
Tanjong .....	128½*	—	—
Tekka .....	19*	—	—
Tekka-Taiping .....	—	—	—
Temoh .....	13*	—	—
Tongkah Compound .....	—	—	—
Tongkah Harbour .....	26½	29	32
Tronoh .....	495*	—	—
Ulu Klang .....	—	—	—

\* 3 Months.

## MISCELLANEOUS TIN COMPANIES' OUTPUTS IN LONG TONS OF CONCENTRATES

	APRIL		MAY	
	Tin	Columbite	Tin	Columbite
Amalgamated Tin Mines ..	198	—	157	—
Anglo-Burma Tin * .....	12	—	—	—
Bangrin .....	30	—	44	—
Beralt .....	40	117†	40	124†
Bisichi .....	39	32	37	20
Ex-Lands Nigeria .....	32	—	41	—
Geevor .....	55	—	55	—
Gold and Base Metal .....	32	5	—	—
Jantar Nigeria .....	9½	17	13	24
Jos Tin .....	8	—	4	—
Kaduna Prospectors .....	3	—	—	—
Kaduna Syndicate .....	12½	—	15	—
Katu Tin .....	30	—	27	—
Keffi Tin .....	—	—	—	—
London Nigerian Mines ..	—	—	—	—
Mawchi Mines .....	—	—	—	—
Naraguta Extended .....	9	—	6	—
Naraguta Karama .....	7	—	5	—
Naraguta Tin .....	—	—	—	—
Renong Consolidated .....	—	—	—	—
Ribon Valley (Nigeria) ..	10	1	—	—
Siamese Tin Syndicate .....	51	—	59	—
South Bukuru .....	—	—	—	—
South Crofty .....	78	—	76	—
Tavoy Tin .....	—	—	—	—
Tin Fields of Nigeria .....	—	—	—	—
United Tin Areas of Nigeria	—	—	—	—

\* 3 months. † Wolfram.

SOUTH AFRICAN MINERAL OUTPUT  
March, 1959.

Gold .....	1,508,511 oz.
Silver .....	155,133 oz.
Diamonds .....	66,481 carats.*
Coal .....	3,221,913 tons.
Copper .....	(a) 17 tons in matte and copper-gold concentrates. (b) 4,642 tons of 99.34%.
Tin .....	219 tons concs.
Platinum (concentrates, etc.)	—
Platinum (crude) .....	—
Asbestos .....	14,356 tons.
Chrome Ore .....	51,870 tons.
Manganese Ore .....	89,257 tons.
Lead Concs. .....	33 tons.

\* Feb., 1959.

IMPORTS OF ORES, METALS, ETC., INTO  
UNITED KINGDOM

	MARCH	APRIL
Iron Ore .....	888,557	754,344
Manganese Ore .....	23,574	41,776
Iron and Steel .....	48,203	58,490
Iron Pyrites .....	10,313	13,784
Copper Metal .....	44,291	36,627
Tin Ore .....	5,389	3,417
Tin Metal .....	—	—
Lead .....	22,252	23,588
Zinc Ore and Conc. .....	6,156	4,583
Zinc .....	15,437	14,985
Tungsten Ores .....	320	305
Chrome Ore .....	7,103	12,539
Bauxite .....	43,541	26,146
Antimony Ore and Concs. ..	1,765	—
Titanium Ore .....	18,452	42,807
Nickel Ore .....	—	—
Tantalite/Columbite .....	30	14
Sulphur .....	35,872	25,669
Barytes .....	2,566	2,663
Asbestos .....	9,348	8,779
Magnesite .....	2,122	1,318
Mica .....	631	437
Mineral Phosphates .....	88,262	127,063
Molybdenum Ore .....	147	279
Nickel .....	37,505	80,759
Aluminium .....	451,975	389,005
Mercury .....	125,710	113,995
Bismuth .....	130,339	88,049
Cadmium .....	143,504	194,508
Cobalt and Cobalt Alloys ..	316,806	11,540
Selenium .....	8,051	27,867
Petroleum Motor Spirit .....	55,536	80,457
Crude .....	818,234	968,388

## Prices of Chemicals

The figures given below represent the latest available.

		£	s.	d.
Acetic Acid, Glacial .....	per ton	106	0	0
" " 80% Technical .....	"	97	0	0
Alum. Comm. .....	"	25	0	0
Aluminium Sulphate .....	per lb.	16	10	0
Ammonia, Anhydrous .....	per ton	59	0	0
Ammonium Carbonate .....	"	26	0	0
" Chloride, 98% .....	"	102	0	0
" Phosphate (Mono- and Di-) ..	"	3	0	0
Antimony Sulphide, golden .....	per lb.	47	10	0
Arsenic, White, 99/100% .....	per ton	13	0	0
Barium Carbonate (native), 94% ..	"	53	0	0
Barytes (Bleached) .....	per gal.	20	0	0
Benzene .....	per ton	30	7	6
Bleaching Powder, 36% Cl. ....	"	45	0	0
Borax .....	"	75	10	0
Boric Acid, Comm. ....	"	40	17	9
Calcium Carbide .....	"	13	5	0
" Chloride, solid, 70/75% .....	per lb.	1	6	0
Carbolic Acid, crystals .....	per ton	62	10	0
Carbon Bisulphide .....	per lb.	2	2	0
Chromic Acid (ton lots) .....	per cwt.	11	0	0
Citric Acid .....	per ton	76	0	0
Copper Sulphate .....	per gal.	1	2	0
Cresosote Oil (f.o.r. in Bulk) ..	"	6	10	0
Cresylic Acid, refined .....	per carboy	13	0	0
Hydrochloric Acid 28° Tw. ....	per lb.	1	1	0
Hydrofluoric Acid, 59/60% .....	per ton	3	17	6
Iron Sulphate .....	"	124	0	0
Lead, Acetate, white .....	"	116	0	0
" Nitrate .....	"	107	5	0
" Oxide, Litharge .....	"	106	5	0
" Red .....	"	117	0	0
" White .....	"	40	0	0
Lime Acetate, brown .....	"	20	0	0
Magnesite, Calcined .....	"	9	0	0
" Raw .....	"	16	0	0
Magnesium Chloride, ex Wharf ..	"	15	10	0
" Sulphate, Comm. ....	per gal.	6	3	0
Methylated Spirit, Industrial, 66 O.P.	per ton	37	10	0
Nitric Acid, 80° Tw. ....	"	129	0	0
Oxalic Acid .....	per lb.	1	4	0
Phosphoric Acid (S.G. 1.750) .....	per ton	74	10	0
Pine Oil .....	per lb.	21	0	0
Potassium Bichromate .....	per ton	21	0	0
" Carbonate (hydrated) .....	"	7	2	0
" Chloride .....	"	Nominal		
" Iodide .....	"	Nominal		
" Amyl Xanthate .....	"	Nominal		
" Ethyl Xanthate .....	"	Nominal		
" Hydrate (Caustic) flake .....	per ton	118	0	0
" Nitrate .....	per cwt.	4	1	0
" Permanganate .....	per ton	193	10	0
" Sulphate, 50% .....	"	21	1	0
Sodium Acetate .....	"	75	10	0
" Arsenate, 58-60% .....	"	Nominal		
" Bicarbonate .....	"	15	0	0
" Bichromate .....	per lb.	1	0	0
" Carbonate (crystals) .....	per ton	Nominal		
" (Soda Ash) 58% .....	"	13	15	0
" Chlorate .....	per cwt.	91	0	0
" Cyanide 100% NaCN basis .....	"	6	6	6
" Hydrate, 70/77%, solid .....	"	33	0	0
" Hyposulphite, Comm. ....	"	32	15	0
" Nitrate, Comm. ....	"	25	0	0
" Phosphate (Dibasic) .....	"	40	10	0
" Prussiate .....	per lb.	1	0	0
" Silicate .....	per ton	11	0	0
" Sulphate (Glauber's Salt) .....	"	9	15	0
" Sulphate (Salt-Cake) .....	"	10	0	0
" Sulphide, flakes, 60/62% .....	"	38	12	6
" Sulphite, Comm. ....	"	27	10	0
Sulphur, American, Rock (Truckload) ..	"	14	0	0
" Ground, Crude .....	"	17	10	0
Sulphuric Acid, 168° Tw. ....	"	12	0	0
" free from Arsenic, 140° Tw. ....	"	7	0	0
Superphosphate of Lime, 18% P <sub>2</sub> O <sub>5</sub> ..	"	14	18	6
Tin Oxide .....	"	Nominal		
Titanium Oxide, Rutile .....	"	172	0	0
" White, 25% .....	"	85	0	0
Zinc Chloride .....	"	95	0	0
" Dust, 95/97% (4-ton lots) .....	"	109	0	0
" Oxide .....	"	95	0	0
" Sulphate .....	"	32	0	0

# Share Quotations

Shares of £1 par value except where otherwise stated.

## GOLD AND SILVER:

### SOUTH AFRICA:

	MAY 7, 1959	JUNE 8, 1959
Blinkfontein (5s.)	4 7 6	4 17 6
Blyvooruitzicht (2s. 6d.)	1 6 9	1 8 6
Brakpan (5s.)	5 9	5 6
Buffelsfontein (10s.)	2 7 6	2 10 0
City Deep	19 6	1 1 9
Consolidated Main Reef	1 0 6	1 0 6
Crown Mines (10s.)	1 4 6	1 7 0
Daggafontein (5s.)	1 9 3	1 12 0
Dominion Reefs (5s.)	14 3	15 3
Doornfontein (10s.)	1 12 0	1 13 9
Durban Roodepoort Deep (10s.)	1 13 3	1 15 6
East Champ d'Or (2s. 6d.)	2 3	2 3
East Daggafontein (10s.)	9 3	9 6
East Geduld (4s.)	1 5 6	1 8 3
East Rand Ext. (5s.)	1 12 6	1 13 3
East Rand Proprietary (10s.)	2 3 6	2 10 0
Freddie's Consol.	2 6	2 6
Free State Dev. (5s.)	11 3	11 3
Free State Geduld (5s.)	8 18 0	9 15 6
Free State Saaiplaas (10s.)	19 0	1 1 0
Geduld	3 4 6	3 10 0
Government Gold Mining Areas (4s.)	1 2 6	1 3 0
Grootvlei (5s.)	17 9	19 6
Harmony (5s.)	2 1 0	2 2 9
Hartebeestfontein (10s.)	3 9 0	3 10 3
Libanon (10s.)	9 6	11 6
Lorraine (10s.)	1 11 3	1 11 9
Luipaards Vlei (2s.)	10 6	9 9
Marievale (10s.)	1 0 6	1 8 0
Merrispruit (5s.)	4 6	4 6
Modderfontein B (3s.)	2 3	2 3
Modderfontein East	14 9	16 3
New Kleinfontein	5 0	5 6
New Pioneer (5s.)	2 1 0	2 5 0
New State Areas (15s. 6d.)	2 0	2 0
President Brand (5s.)	3 11 3	3 10 9
President Steyn (5s.)	1 12 3	1 12 9
Rand Leases (9s. 3d.)	7 3	7 0
Randfontein	1 3 6	1 6 0
Rietfontein (3s. 2d.)	4 9	5 0
Robinson Deep (5s. 6d.)	7 9	7 9
Rose Deep (6s. 6d.)	13 0	14 3
St. Helena (10s.)	2 16 6	3 4 3
Simmer and Jack (1s. 6d.)	2 3	2 3
South African Land (3s. 6d.)	1 2 6	1 3 0
Springs (5s.)	2 0	2 0
Stilfontein (5s.)	2 1 0	2 2 6
Sub Nigel (5s. 6d.)	13 0	13 9
Vaal Reefs (5s.)	2 1 3	2 4 3
Van Dyk (7s. 9d.)	5 0	5 3
Venterspost (10s.)	17 0	18 0
Virginia (5s.)	7 3	7 3
Vlakfontein (10s.)	19 6	1 0
Vogelstruisbult (10s.)	9 0	9 0
Welkom (5s.)	1 2 9	1 5 3
West Driefontein (10s.)	6 7 6	7 0 0
West Rand Consolidated (10s.)	1 4 0	1 6 3
West Witwatersrand Areas (2s. 6d.)	2 18 3	3 5 6
Western Holdings (5s.)	7 8 6	7 0 0
Witwatersrand (10s.)	1 10 0	1 10 3
Witwatersrand Nigel (2s. 6d.)	1 2 6	1 2 6
Zandpan (10s.)	19 9	1 0 3

### RHODESIA:

Cam and Motor (2s. 6d.)	9 0	9 0
Chicago-Gaika (10s.)	16 0	15 0
Coronation (2s. 6d.)	4 0	4 6
Falcon (5s.)	7 9	8 0
Globe and Phoenix (5s.)	1 11 9	1 13 0
Motapa (5s.)	9	9

### GOLD COAST:

Amalgamated Banket (3s.)	1 3	1 0
Ariston Gold (2s. 6d.)	4 3	4 0
Ashanti Goldfields (4s.)	16 6	16 9
Bibiani (4s.)	2 6	2 6
Bremang Gold Dredging (5s.)	1 9	2 6
Ghana Main Reef (5s.)	2 3	2 6
Konongo (2s.)	1 9	2 0
Kwahu (2s.)	4 0	4 0
Western Selection (5s.)	5 3	5 6

### AUSTRALASIA:

Gold Fields Aust. Dev. (3s.), W.A.	2 0	2 3
Gold Mines of Kalgoorlie (10s.)	8 9	9 6
Great Boulder Proprietary (2s.), W.A.	12 9	13 6
Lake View and Star (4s.), W.A.	1 7 0	1 9 0
London-Australian (2s.)	11	9
Mount Morgan (10s.), Q.	13 6	14 3
New Guinea Gold (4s. 3d.)	2 0	2 0
North Kalgoorlie (1912) (2s.), W.A.	11 0	11 9
Sons of Gwalia (10s.), W.A.	3 6	3 9
Western Mining (5s.), W.A.	11 0	11 0

### MISCELLANEOUS:

Fresnillo (\$1.00)	1 13 9	1 14 0
Kenton Gold Areas	2 0 6	2 0 0
St. John d'el Rey, Brazil	4 7 6	3 17 6
Yukon Consolidated (\$1)	5 0	5 3

### COPPER:

Bankroft Mines (5s.), N. Rhodesia	1 7 0	1 6 3
Esperanza (2s. 6d.), Cyprus	1 7 1	1 9
Indian (2s.)	5 0	5 0
MTD (Mangula) (5s.)	10 0	9 9
Messina (5s.), Transvaal	5 8 3	5 16 6
Mount Lyell, Tasmania	1 4 3	1 6 6
Nchanga Consolidated, N. Rhodesia	11 2 6	12 3 9
Rhokana Corporation, N. Rhodesia	26 15 0	28 5 0
Roan Antelope (5s.), N. Rhodesia	8 9	8 0
Tanganyika Concessions (10s.)	2 9 6	2 9 0

### LEAD-ZINC:

Broken Hill South (1s.), N.S.W.	10 9	10 9
Burma Mines (3s. 6d.)	2 0	1 9
Consol. Zinc Corp. Ord.	3 1 9	3 5 9
Lake George (5s.), N.S.W.	4 0	3 9
Mount Isa, Queensland (5s. Aust.)	1 16 6	2 0 3
New Broken Hill (5s.), N.S.W.	1 15 3	1 16 9
North Broken Hill (5s.), N.S.W.	4 1 3	4 1 0
Rhodesia Broken Hill (5s.)	8 6	9 6
San Francisco (10s.), Mexico	19 3	19 3

### TIN:

Amalgamated Tin (5s.), Nigeria	7 3	8 0
Angat (4s.), Malaya	9 6	9 9
Ayer Hitam (5s.), Malaya	1 19 0	1 17 0
Beralit (5s.), Portugal	1 10 6	1 10 6
Bisichi (2s. 6d.), Nigeria	4 0	3 9
Ex-Lands (2s.), Nigeria	2 3	2 3
Geevor (5s.), Cornwall	1 3 6	1 7 3
Gold Base Metals (2s. 6d.), Nigeria	1 0	1 0
Hongkong (5s.), Malaya	4 3	4 9
Jantar Nigeria (5s.), Cornwall	3 9	3 9
Kaduna Syndicate (2s.), Nigeria	2 3	2 0
Kamunting (5s.), Malaya	12 6	11 9
Malayan Tin Dredging (5s.)	17 0	17 3
Mauchi Mines (4s.), Burma	2 6	2 0
Naragat Extended (5s.), Nigeria	9 6	8 9
Pahang (5s.), Malaya	5 9	8 9
Siamese Synd. (5s.)	9 9	8 9
South Crofty (5s.), Cornwall	4 0	4 0
Southern Kinta (5s.), Malaya	1 2 9	1 3 3
Southern Malayan (5s.)	14 9	14 3
Southern Tronoh (5s.), Malaya	13 3	13 6
Sungei Besi (4s.), Malaya	1 0 3	1 0 3
Sungei Kinta, Malaya	16 0	16 0
Tekka (12s. 6d.), Malaya	4 0	3 9
Tronoh (5s.), Malaya	14 3	14 3
United Tin Areas (2s. 6d.), Nigeria	1 0	9

### DIAMONDS:

Anglo American Investment	12 10 0	13 12 6
Consol African Selection Trust (5s.)	19 3	19 6
Consolidated of S.W.A. Pref. (10s.)	10 6	11 0
De Beers Deferred (5s.)	6 18 9	7 3 3

### FINANCE, ETC.

African & European (10s.)	4 2 6	4 6 0
Anglo American Corporation (10s.)	8 18 9	9 15 0
Anglo-French Exploration	1 9 3	1 10 0
Anglo Transvaal 'A' (5s.)	2 1 6	2 7 0
British South Africa (15s.)	4 11 0	4 17 6
British Tin Investment (10s.)	1 1 3	1 1 9
Broken Hill Proprietary	2 1 9	2 5 6
Camp Bird (10s.)	12 6	11 6
Central Mining	4 0 6	4 6 6
Central Provinces Manganese (10s.)	1 10 0	1 8 6
Consolidated Gold Fields	3 9 0	3 14 0
Consolidated Mines Selection (10s.)	2 0 0	2 6 0
East Rand Consolidated (5s.)	2 0	2 3
Free State Development (5s.)	11 3	11 3
General Exploration O.F.S. (2s. 6d.)	6 3	5 9
General Mining and Finance	6 15 9	7 1 3
H.E. Proprietary (5s.)	15 6	15 0
Johannesburg Consolidated	3 9	3 8 3
London & Rhod. M. & L. (5s.)	7 9	8 0
London Tin Corporation (4s.)	10 0	9 3
Lydenburg Est. (5s.)	18 3	19 3
Marsman Investments (10s.)	1 9	1 9
National Mining	1 9	2 6
Rand Mines (5s.)	4 10 0	5 2 6
Rand Selection (5s.)	2 10 3	2 17 0
Rhodesian Anglo American (10s.)	3 18 0	4 5 0
Rhodesian Corporation (5s.)	3 3	3 6
Rhodesian Selection Trust (5s.)	16 6	16 6
Rio Tinto (10s.)	2 12 6	2 7 6
Selection Trust (10s.)	5 8 9	5 16 0
South West Africa Co. (3s. 4d.)	12 6	12 6
Union Corporation (2s. 6d.)	2 19 3	3 5 6
Vereniging	6 1 3	6 8 9
West Rand Inv. Trust (10s.)	2 17 6	3 1 3



# THE MINING DIGEST

## A RECORD OF PROGRESS IN MINING, METALLURGY, AND GEOLOGY

In this section abstracts of important articles and papers appearing in technical journals and proceedings of societies are given, together with brief records of other articles and papers; also notices of new books and pamphlets and lists of patents on mining and metallurgical subjects.

### Mining in the Klerksdorp Area

Operations at a property being worked by New Klerksdorp Gold Estates are described in an article by S. D. Loxton in the *South African Mining and Engineering Journal* for May 1. The author says that the original discovery of gold in the Klerksdorp district is reputed to have occurred on the slopes of the koppie known as Railway Hill, west of the town. The specimen assayed yielding 10 oz. 7 dwt. and 11 gr. per ton. The reef from which the specimen was obtained became known as the "Commonage Reef" and was exploited by individuals, syndicates, and some mining companies, the best known of which were the Commonage Reef Mine and New Mines. It is at present worked by New Klerksdorp Gold Estates, which was formed in 1936, bought the New Mines interests in 1943, and has since worked both Gold Estates and Commonage reefs, the major work since 1943 being confined to the last-named. The site of the reputed initial discovery of gold in this district is included in the mining area of the present company.

#### Reef Horizons

**Gold Estates Reef.**—This reef compares with the Kimberley reef and varies from a massive deposit having a width of about 20 ft., with boulders up to 6 in. diameter, down to a 2-in. reef with  $\frac{1}{2}$  in. to 1 in. pebbles. Payability is erratic but a fairly large area in the Southern section of the mine has been successfully exploited. The walls consist of quartzites and the reef outcrops along approximately three-quarters of the company's area. It dips from east to west at an average of 25° and lies unconformably over the Commonage and associated reefs. It is extensively dislocated by a series of faults dipping at approximately 20° in an easterly direction with the result that the outcrop has in many instances been duplicated. These faults have not disturbed the Commonage or Ada May reefs. A point of interest is that from time to time a fair number of diamonds have been found on the property. They occur in the outcrop portion of the Gold Estates reef, are predominantly green, and of little value.

**Commonage Reef.**—This has been correlated as the main reef of the same series. It consists of four distinct bands, the top of which is referred to as the marker and is normally to be found 6 ft. to 8 ft. above the other three bands which are known as the Top, Middle, and Bottom bands. The "marker" is a narrow band up to 12 in. in thickness, consisting of closely packed quartz pebbles up to  $\frac{1}{2}$  in. in diameter, together with acid lava pebbles. It con-

tains gold and uranium, but has not yet proved to be of any economic interest. The Top and Middle bands are of major economic importance and vary considerably in width from a few inches to 12 ft. They are closely associated over most of the area and where they consist of closely packed pebbles with a well mineralized matrix are normally payable. Pebbles are up to 2 in. in diameter on the top and Middle bands with gold and uranium values in sympathy. The Bottom band is erratic both from consistency of occurrence and in value, with the exception that even where higher gold values are found on this reef the uranium values are invariably low. All the bands are lenticular and are frequently separated by a band of quartzite which varies from non-existent to 5 ft or 6 ft. in thickness.

**Ada May Reef.**—This reef occurs approximately 250 ft. in the foot-wall of the Commonage reef and is roughly parallel to it. The reef varies from 6 in. to 36 in. in width, so far as is known, an average of 18 in. It consists of closely packed pebbles with a well mineralized matrix. The values exposed to date are moderate and not of economic importance under present conditions.

#### Mine Layout

Two shafts serve the present workings—an incline dipping from east to west, originally developed on Gold Estates reef and at a later stage roughly graded and continued to intersect the Commonage Reef, together with a sub-incline dipping from west to east and developed on Commonage Reef. The shafts are connected by an ore-pass system. The incline shaft (No. 6) is situated roughly in the middle of the mining area but well to the north of the portion where most of the current work is in progress.

The other shaft is also to the north of the reduction works. Ore is transported underground on 9 level from the workings to the sub-incline shaft by means of a 4-ton diesel loco. hauling  $1\frac{1}{2}$ -ton cars, and on surface from 6 shaft to the reduction works by a 7-ton diesel loco. hauling 4-ton hoppers.

Reef drives are developed north and south of the shaft system at 100-ft. vertical intervals, giving backs of 300 ft. to 400 ft. with dip connexions 500 ft. apart on strike. Mining methods vary considerably and each working face is treated on its merits. Generally, whatever Gold Estates reef is worked, pillars are cut at 30-ft. intervals on dip and strike with stick support at 10-ft. centres between the pillars, temporary sticks being used on the face

side of the scatter wall and permanent sticks being installed as the wall moves forward with the face.

Commonage Reef is mined predominantly by face scraping with a double scatter wall (packed) between supports to protect the swept area, but rescue and strike tracks feeding a central gulley are also made use of. As far as possible where payability permits pillars have been dispensed with below 6 level—i.e., about 500 below surface—2 ft. and 2 ft. to 8 ft. mat packs at 10 ft. centres on strike and 12 ft. centres on dip form the main support.

One of the interesting problems to be successfully tackled during the last few years followed the discovery of a good value reef existing some 24 in. in the hanging wall of a collapsed area between 6 and 7 level on Commonage Reef. The average thickness of this band was about 18 in. with high gold and uranium values. The caved hanging wall was badly fractured particularly in the vicinity of old pillars and boulders of from  $\frac{1}{2}$  to 10 tons in size were freely distributed over the area. Some portions of the hanging wall had settled normally and were not badly broken up. From records it was found that the settlement was of the order of 4 ft. and investigation on 3 level Gold Estates showed that the movement had reached to at least this level, as gaps of up to 6 in. between bedding planes in the drive were visible.

Using the least disturbed hanging wall portion to be found a connexion from 6 to 7 level on dip was established, support for this connexion taking the form of stone walls packed either side of the travelling way in paddocks 6 ft. by 10 ft. with 4 ft. intervals on dip between the paddocks. The connexion was put up from 7 to 6 and a scraper used to handle the reef. The completed connexion had an average height of 6 ft. and width of 8 ft. This served as a main artery till the faces had been advanced approximately 40 ft. north and south when further escape ways on dip were established.

The surplus waste which was created when the production programme commenced was disposed of by consolidating the intermediate track and the 7 level drive. Advances of 4 ft. of waste stripping

followed by 4 ft. of reef stripping were made in the initial instance, the reef over the travelling way waste paddocks being sacrificed. From this point on the waste paddocks bordering the travelling way were extended on strike, wheel-barrowing being used to handle the reef and deliver it to the scraper. Temporary support in the form of sticks was freely used and in some cases half of the boulder was supported on sticks and stone walls prior to any blasting being done on the unsupported remainder, then after stripping the reef from the one half support was built under this portion and the remaining reef popped down.

### Reduction Works

The original design of the crushing section did not allow for any waste sorting operations and initial efforts at sorting were both expensive and inefficient, 21 boys being used to sort 16 tons a day. Present arrangements enable a sorting duty of 5 tons to 8 tons a boy per shift to be achieved, and sorting stepped up to 20% of the ore delivered to the mill.

One 20 ft. by 6 ft. 6 in. mill is in use on the mine. The unit was in very bad condition. Changes made to this machine include the fitting of roller bearings to the tube and the driving shaft, together with replacement of girth gear and pinion. The combined effect of all changes made has dropped the amperage from 75 to 62 on full load. The supply voltage is 2,200. White-iron block liners were replaced by Osborne bars.

The rake classifier was replaced by a 24-in. cyclone for a cost of £220.

Zinc boxes have been replaced by a zinc dust feeder and Johnson type filter press with 24 leaves and 298 ft. of filter area. This press has handled 25 tons per hour of solution but its maximum capacity has not been determined. Operating costs per ton of solution precipitated are of the order of 1.75 to 2.0d. per ton. This represents a saving of 2d. per ton on the zinc box method. An extra vacuum pump was purchased and additional vacuum created for the filters.

## The Fluid Bed Reactor

A review of current ideas on the use of fluid bed reactors in smelting by S. L. Smith and F. L. Stubbs, of the University of Arizona, appears in the *Mining World* of San Francisco for May. The authors consider that there appear to be three ways in which these appliances may be used.

The first process (Osborn patent) is that of using a reducing medium to produce solid metal, sponge iron. Feed consisting of a calcine made from a pyrite concentrate and assaying 68.3% iron, or 57%  $\text{Fe}_2\text{O}_3$ , and 43%  $\text{Fe}_3\text{O}_4$  is mixed with two parts, by weight, of an inert material, generally lime. All material in the size range of minus 20-mesh, plus 150-mesh is preheated in a rotary kiln by the flue gas coming from a heating muffle located inside the reactor. The temperature of the solid feed to the reactor is maintained at about 750° F. The inert material is solely to prevent the sponge-iron particles from sticking together when they are formed by the

reduction of iron oxide. In general the reducing gas is  $\text{CO}$  or  $\text{H}_2$  produced from the cracking of methane. A temperature of around 1,660° F. is maintained by using bed gas from the reactor and natural gas, if needed, and burning them in a muffle in the reactor to furnish heat for the endothermic reactions. The various oxides of iron travelling through the reactor are reduced to sponge iron by the methane. Fluidizing gas is natural gas, about 12 cu. ft. per lb. of iron reduced, and a make up of bed gas to obtain the proper space rate. Recycling part of the bed gas not only forms a fluidizing gas but its presence seems to prevent the cracking of methane and helps maintain a high specific gravity gas compared to a gas consisting of hydrogen and carbon monoxide. The sponge iron is recovered by a magnetic separator. All non-magnetic material is returned to the feed hopper where it is united with a fresh amount of iron calcine.

The magnetic material contains 90% iron or 79% metallic iron. The bed gas, containing about 6%  $\text{CO}_2$ , 28%  $\text{CO}$ , 30%  $\text{H}_2$ , 28% methane, and 8%  $\text{N}_2$ , is taken to a heat exchanger where the gas to be used for fluidizing is preheated. It then passes to a dust collector and scrubber. Part of the bed gas from the gas holder is blended with natural gas to make the fluidizing medium, which, before entering the bottom of the reactor, is preheated by the escaping gas from the reactor. The other portion of the gas from the holder is used to furnish heat in the reactor for the endothermic reactions that produce sponge iron. This gas, along with any additional natural gas necessary, is burned directly in a muffle located in the reactor. The combustion taking place in the muffle indirectly furnishes heat for the endothermic reactions.

The second possibility of using a fluidizing reactor for smelting is the reduction of an oxide to produce a metal that volatilizes easily (Garbo patent). One of the primary items to overcome is the re-oxidation of the volatile metal back to an oxide, or the reversing of the chemical reaction that produced the metal. An example  $\text{ZnO} + \text{CO} \rightarrow \text{Zn} + \text{CO}_2$ . Any excess of  $\text{CO}_2$ , either from the chemical reaction itself or from the production of  $\text{CO}_2$  by the burning of fuel directly in the reactor, would cause a large amount of blue powder to form. The Garbo patent has the two important conditions necessary for this type of smelting. It provides indirect heat for the endothermic reaction and it also provides a method to keep the carbon dioxide content below the critical point, thus eliminating the formation of a large amount of blue powder.

The feed consists of minus 60-mesh zinc calcine. It is mixed in a ratio of 3 lb. of calcine to 1 lb. of coke. The mixture is fed by a screw conveyor into a cylindrical fluidizing reactor that has a conical-shaped bottom. Fluidizing gas, consisting of nitrogen, or zinc vapour, or carbon dioxide, or methane, is used to suspend the solids. Reduction of the zinc oxide to metallic zinc is accomplished by the reducing agents which are carbon from the coke, carbon monoxide, and perhaps methane. Reduction produces not only zinc vapour but carbon dioxide as well. The carbon dioxide if present in sufficient amounts will cause the metallic zinc to be converted back to zinc oxide.

However, the authors suggest that probably the most intriguing application of the fluidizing reactor to smelting is the double decomposition reaction

between an oxide of a given metal and a sulphide of the same metal. The most promising is, perhaps, the reaction between lead oxide and lead sulphide. The advantages are: (1) Production of a low melting point metal, which might be tapped directly from the fluidizing reactor, (2) a high specific gravity metal which leads to easy separation, (3) galena, a source of lead sulphide and an oxidation product of lead oxide can be easily obtained from galena, and (4) under certain conditions the exothermic reaction of producing the lead oxide from lead sulphide may furnish enough heat to make the entire process autogeneous. The Newnam and Scotch ore hearths have taken advantage of these chemical reactions for many years, but have not been too successful because of the high lead loss in the slag. However, under certain conditions it might be possible to produce lead from lead oxide and lead sulphide in a fluidizing reactor with little loss of lead provided the feed is of extremely high grade material.

In such a reactor the sensible heat in the flue gas from reactor No. 1 might be partially recovered by having a heat exchanger between it and the incoming fluidizing gas for reactor No. 1. Perhaps this heat would also help to evaporate the water going to reactor No. 2, which is used as a fluidizing vapour to suspend the lead oxide and sulphide particles in reactor No. 2. The calcine from reactor No. 1 containing nearly 100% lead oxide is mixed with a stoichiometric amount of lead concentrate containing nearly 100% galena. The two solids after being thoroughly mixed and raised in temperature react to form molten metallic lead and sulphur dioxide. The main fluidizing gas in reactor No. 2 is water vapour. The flue gas leaving reactor No. 2 contains water vapour and sulphur dioxide which is cooled to condense the water, thus allowing a simple means of separation between liquid water and gaseous sulphur dioxide. The liquid water can then be evaporated by the use of a heat exchanger between the condenser and evaporator using excess heat from reactor No. 1. Then the vaporized water can be re-used as a fluidizing gas in reactor No. 2. If all calculations are correct, if the raw material is very pure, and the proper temperatures maintained, it might be possible to have a completely autogeneous process and a final chemical reaction of two solids reacting to produce a liquid metal and a gas, thereby leaving no residue in reactor No. 2 to be discharged.

## Reducing Moisture in Filter Cake

Report of Investigations 5473 of the United States Bureau of Mines, by T. M. Nasiatka and E. R. Palowitch, is entitled "Using Radiant Heat to Reduce Filter-Cake Moisture in Coal Preparation." The report arises from a study undertaken by the Federal Bureau of Mines to determine the possibility of reducing filter-cake moisture by applying radiant heat. Suitable laboratory equipment was set up to study the effect of heat, heating time, proximity of the heater to the filter cake, cake

thickness, and other variables related to the final filter-cake moisture.

New conditions and requirements, it is stated, have forced coal operators to install or expand their existing fine-coal-preparation facilities. Mechanization and the mining of poorer quality coals have resulted in the production of an increased percentage of higher ash fine coal. The high cost of production, lack of storage space, disposal and handling problems, and stream-pollution legislation demand maximum

recovery of fine coal, whereas changes in coal usage and increased freight rates demand a better product. Thermal drying, it is suggested, is at present the only method available that can significantly affect further reduction in moisture content in the fine-size range, but evaporating water by thermal drying is most expensive. It represents a large part of the total cost. Improving filtration by lowering the slurry viscosity by heating is not economical; the report says, because the total filter feed must be heated. Heating only the part of the water that remains in the filter cake after the cake is formed would reduce the net heat input. One possibility is to apply heat directly to the filter cake during the drying phase of the filter cycle. As the maximum available heating time is about 2 min. a high-temperature source of heat is necessary. A gas-fired radiant heater was used because it is an economical high-temperature source of heat and is capable of high thermal efficiency if the flue gases are drawn through the filter-cake. The investigation described in the report was undertaken to determine the filter-cake moisture reductions possible by applying radiant heat and to study the effects of some operating variables.

To study the possibility of reducing filter-cake moisture by radiant heat the laboratory set-up included a radiant heater mounted over a 4-in. diameter filter leaf connected through a filtrate receiver to a vacuum pump. The heater is mounted horizontally by means of a wall bracket and the filter leaf is located directly beneath the heater and parallel to it. The filter-leaf mounting is adjustable so the distance between the heater and filter leaf can be varied. During the cycle a constant vacuum is maintained by means of a regulator. A "flow-rator" between the receiver and the vacuum pump is used to measure the air volume passing through the filter cake.

The heater used had an input rate of approximately 12,000 B.Th.U. per hr.; the output of radiant heat is 6,600 B.Th.U. per hr. representing 55% of the total heat. Vacuum was supplied to the filter leaf by a single-stage, positive displacement, centrifugal vacuum pump having a free air volume of 1.54 c.f.m. A conventional filter leaf of 0.1 sq. ft. was used initially but it was impossible to get the desired uniformity in cake thickness and composition. As the method of filter-cake formation was not important a leaf filter was constructed from 4-in. pipe having an area of 0.087 sq. ft. A mating part (with a pipe extension and hold-down bolts) was constructed and bolted to the 4-in. pipe section and wire screen and cotton-duck filter cloth were placed between the pipe and mating part. The wire screen was used to support the filter cloth; cotton-duck filter cloth was used so that a clean filtrate would be obtained.

The test data obtained indicate that using radiant heat to lower filter-cake moisture is practical. The process, it is considered, has two major applications. In plants where the filter cake is the finished product, the filter-cake moisture will be about 10% points lower. In plants where the filter cake is dried thermally it will reduce the amount of water that must be evaporated and thus result in a lower total moisture for a given feed rate or increase the capacity of the thermal dryer for a product of a given moisture.

In the laboratory tests the heat input was about 50,000 B.Th.U. per hr. per sq. ft. (12,000 B.Th.U. per hr. per 0.24 sq. ft.) of filter area, whereas for

an industrial application the input would be about 21,800 B.Th.U. per sq. ft. (12,000 B.Th.U. per hr. per 0.55 sq. ft.). As the laboratory and commercial installation differed markedly in B.Th.U. per sq. ft. this would be partially compensated for by more efficient use of the heat in industrial applications. Maximum thermal efficiency would be obtained by using all the sensible heat in the flue gases. In the laboratory set-up no provisions were made to prevent the escape of the flue gases; in a commercial installation provisions could be made for directing the flue gases through the filter cake.

To equip a filter for radiant heating would require covering each face of the discs with enough heaters for the heating time desired. As many heaters as required would be grouped together as a unit and mounted parallel to the filter disc. Twenty units of 30 heaters each would be required to cover 120° of the filter cycle on an 8 ft. 10 in. 10-disc filter. In most commercial filters the cake thickness varies; therefore the heaters must be mounted with enough clearance to prevent mechanical interference with normal filter operation and/or damage to the heaters.

**Conclusions.**—Marked reductions in filter-cake moisture were obtained by applying radiant heat. Filter-cake moisture decreases with decreasing cake thickness, longer heating time, and closer proximity of the heater to the filter cake.

Tests showed that as the clay content of the feed increased the cake moisture also increased. However, regardless of the clay content, an appreciable amount of water was removed by applying heat.

Maximum benefit was obtained from the heat when it was applied during the beginning of the drying phase of the filter cycle. Lower moistures were produced by applying heat in the earlier stages of the drying cycle than by an equivalent heat exposure during the latter part of the cycle.

The cake moisture decreased with higher vacuum. Increasing the vacuum from 5 in. to 24 in. of Hg caused the moisture to drop 11.6% and the volume of air per sq. ft. of filter area to increase from 0.7 cu. ft. to 14.9 cu. ft. per min.

Removal of additional water by the vacuum filter as a result of directly applying radiant heat to the filter cake is caused by a combination of lowered fluid viscosity and evaporation. Maximum thermal efficiency is obtained when all the flue gas from the heater is pulled through the filter cake.

In the laboratory the filter was smaller than the heater element, providing a maximum concentration of heat per unit area, but in a full-scale installation the concentration of heat per unit area will be less because the heater element will represent only 44% of the total area of the heater. The difference, in B.Th.U. per unit area, between the laboratory and commercial installation would be partly compensated for by more efficient use of the latent heat contained in the flue gas in a commercial installation.

Laboratory results simulating commercial filter operation showed that applying heat for 40 sec. (two-thirds of available drying time on a 3-min. filter cycle) was the most economical for all cake thicknesses tested. Based upon the laboratory data and the previously stated cost estimates for heater operation and maintenance, a minimum total cost of \$0.83 per ton of water removed is indicated with cake-moisture reduction of 7.2% to 17.8%. This cost estimate is about half the cost of removing water by conventional thermal drying.



## Diamond Drilling at a Tasmanian Lead-Zinc Mine

Another paper in the "F. L. Stillwell Anniversary Volume" of the Australasian Institute of Mining and Metallurgy, referred to in the May Issue, is one by V. M. Cottle on "Diamond Drillhole Deflection at Rosebery, Tasmania." The author says that such drilling at this mine is characterized by a pronounced deflexion which causes holes to curve in such a way that they trend towards normality with the cleavage or schistosity. Holes drilled steeper or flatter than the cleavage will continue to steepen or flatten until they pass through the vertical or horizontal respectively and trend in the opposite sense.

The Rosebery lead-zinc mine, situated on the western slopes of Mount Black, in Western Tasmania, occurs in a bedded series of pyroclastic rocks which strike 355° and dip 48° E. The sequence from east to west with average width is: Massive pyroclastics, 5,000 ft. +; black slate, 110 ft.; "Tuff" (sericite schist)—ore horizon, 150 ft., and quartz schist, 60 ft. A marked schistosity (locally known as cleavage) is strongly developed in the three lower members and weakly developed in the massive pyroclastics, becoming progressively weaker as the distance from the boundary increases. This cleavage, it is believed, is the influencing factor in the drill-hole deflexion on the field and its attitude is therefore of prime importance when considering the expected behaviour of long holes. It strikes 360° and dips 55° E. Analysis of 250 observations taken in the host rock and black slate show that 70% lie within 10° and 95% within 20° of this average figure. However, the massive pyroclastics are highly competent rocks which would have responded differently to the forces producing the cleavage on the underlying formations, but they have sufficient schistosity to cause a hole deflexion of a lower order than that experienced in the highly sheared rocks. Approximately 20,000 ft. of drilling is done through these formations each year in BX, AX, and EX sizes and holes range from a few hundred to several thousand feet in length.

The majority of holes drilled at Rosebery are directed at right angles to the strike of the cleavage; consequently, most of the evidence which supports the ideas put forward in the paper comes from the dip surveys of several hundred of these holes. Graham Hall, in 1947, introduced the practice of graphing them by plotting the angle of inclination against the depth of observation in order to record the survey information in its most usable form.

Except for short pilot holes no attempt is ever made to keep a hole straight. The slow and expensive technique of wedging is used only to deflect out of an existing hole, to obtain a second intersection, or to deflect past an obstruction. Targets are usually intersected with an accuracy of better than 10% by orienting holes in such a way that their natural deflection will carry them to their objective. The distance by which a hole misses its target is considered as a percentage of the length of the hole. Faith in this principle was perhaps best demonstrated when a hole was directed on a bearing of 35° grid at *minus* 82°, to hit a target which lay on a bearing of 302° grid at *minus* 81° from the collar of the hole. The hole curved round as expected and at 1,200 ft. passed directly over the target but was 50 ft. higher than planned (an error of only 4%).

While holes of this type are not required frequently it is common practice to direct a hole easterly to hit a target which lies to the west of the collar. The surface sites drill must be located on the steep westerly slopes of Mount Black, the terrain is difficult to negotiate, and for every foot that a drill site is moved to the east there is more than a foot increase in depth to the ore horizon. Consequently any feature which helps to reduce the number of drill sites is valuable.

It is realized that the accuracy of the evidence is dependent upon the accuracy of the drill-hole surveys. These are made with a modified form of the "Radiolite" for bearing and the acid etch for dip, both being read to the nearest one degree. When holes are intersected by mine workings their position is checked by theodolite survey and rarely are they found to be more than a few feet from the position plotted as a result of the drill-hole survey. This, *plus* the accuracy with which the majority of holes follow the courses plotted for them, justifies confidence in the methods used. Occasionally, for some unknown reason, a hole will behave erratically, but these are so few that their cost is insignificant when compared with the total cost of drilling.

The object of the study of deflection is to achieve increasingly greater accuracy in the layout of future holes. The average behaviour of a hole is such that it travels and deflects in a plane which is perpendicular to the plane of the cleavage. Thus it is necessary to apply correction only in the vertical plane for holes drilled normal to the strike of the cleavage. However, in oblique holes the correction must be applied in an inclined plane—*i.e.*, to both the bearing and plunge of the drill hole. The writer believes this can be done most readily by re-sorting the stereographic projection.

A stereogram given in the paper shows the plane of the cleavage with its pole at *p*. A point *t* shows the bearing and plunge of the line joining collar and target (50° at *minus* 40°). Because the hole will travel in a plane normal to the cleavage plane the great circle passing through *t* and *p* will represent the plane of the drill hole. It is in this plane that the adjustment for deflection must be made. The apparent dip of the cleavage is in the direction 50° to 47½°; therefore the hole will have to be steeper than 40° and less than 47½° to hit its target. Assuming the necessary correction obtained from the graphs is 5°, this is marked off along the great circle from *t* and the new point *d* represents the initial bearing and angle of inclination of the required drill hole (46° at *minus* 44°).

McKinstry (1948), says the author, records that holes inclined at small angles to the bedding may curve towards parallelism with the bedding plane, but when intersecting bedding or cleavage at large angles tend to assume a direction at right angles to the laminated structure. Cumming (1951) makes a similar statement regarding bedding but does not indicate the effect of cleavage. The writer says he has no experience of drilling in bedded uncleaved formations, but in schistose or well-cleaved rocks has never observed a tendency towards achieving parallelism with the planar structure. At Rosebery the cleavage is the main influence with perhaps a slight modification by the bedding where it is folded across the path of the drill hole.

The factual data presented in the paper is only

applicable in the Rosebery mine, the author says, but it is believed that the underlying ideas and the approach to the problem could be used anywhere. A similar set of data has been compiled for the Hercules mine and is used with success. Hopes of finding some fundamental principle which could be

applied everywhere have so far not been realized. It is believed that the rate of change of deflection is in some way related to the angle of incidence of the drill hole with the cleavage, but up to the present time this cannot be convincingly demonstrated.

## Mineral Resources of Newfoundland

An assessment of the stage of exploration in Newfoundland at the end of 1958 and of its mineral resources is made by D. Johnston in the *Canadian Mining Journal* for April. The author says that the Province has, of course, enjoyed recognition as an iron-ore producer since the first shipment left Wabana in 1895. This, now modernized mechanized operation of the Dominion Wabana Ore Company, estimates huge reserves of red, oolitic haematite. More than 2,000,000 tons of this 51% ore are shipped each year. Eighty per cent. of this production reaches European steel makers and the balance is supplied to the parent company's plant in Sydney, Nova Scotia. The room and pillar method of extraction being employed gives the operation all the appearances of a major coal-mining project.

One of America's most outstanding mineral developments of the past decade has taken place in the region of western Labrador and adjacent New Quebec. Since the slogan "Iron Ore in '54" became a reality about 20,000,000 tons of direct-shipping haematite have been produced from the Newfoundland portion of the region. The bulk of this material is delivered to U.S. steel makers although a small amount reaches Dosco plants at Sydney and Hamilton and finds markets in Europe. The reserves of this new iron province may not, for many years hence, become completely delineated, but estimates, together with a few other figures, will serve to signify the ever increasing stature of these operations. The Iron Ore Company of Canada (an association of Labrador Mining and Exploration, Hollinger North Shore, and M. A. Hanna) has outlined 44 separate deposits containing a published total of 417,000,000 tons of direct shipping 51% iron ore in the Knob Lake area alone. The largest of these operations is taking place at Ruth Lake in Newfoundland. It is estimated that six more years will elapse before the first of these deposits is mined out. Indeed, the 35,000,000 tons shipped in three years prior to 1958 occasioned no noticeable change in the overall reserve figures. This project alone, including the necessary transportation facilities, has required a capital expenditure of \$300,000,000. South of Knob Lake and on the north side of Wabush Lake, the more highly metamorphosed Trough formations contain additional tonnages of beneficiating magnetite. Grade here is of the order of 35% to 40% iron. The Iron Ore Company foresees another \$150,000,000 expenditure to bring this area into production at five to six million tons of beneficiated ore annually. Reserves are quoted as 1,000 million tons proven, plus an equal amount inferred.

During the past year, says the author, Labrador Mining and Exploration expended \$325,000 on geological and geophysical surveying and diamond drilling. AEM (airborne electro-magnetic) anomalies were "ground checked" by three geophysical parties. Sixty square miles in the Wabush Lake area were evaluated by three geological groups and

8,000 ft. of diamond drilling completed by nine machines. In the Knob Lake area 13 diamond drills were operated in a programme designed to extend known reserves. The Iron Ore Company completed two new airstrips to service continued development in the Wabush Lake country. Several areas (totalling 28 sq. miles) were tested by 12,000 ft. of diamond drilling distributed over 188 holes. An additional 16 sq. miles were geologically mapped by two 12-man parties, at 100 ft. to the inch. Extensive sampling and surveying were also conducted by these groups. An 80-ton bulk ore sample from this area was shipped to a laboratory for metallurgical study.

In the same region, but south of the lake from which it has been named, Wabush Iron Company (a partnership of Pickands Mather, Interlake Iron, Stelco, and Youngstown Sheet and Tube) has outlined 1,200,000,000 tons of haematite averaging 38% iron which is intended to be beneficiated to a 65% grade. Production from this area of Newfoundland is expected to become 10,000,000 tons per annum and already construction of a 42-mile rail line connecting with the Quebec North Shore and Labrador road is underway. These participating companies tested possible extensions of the iron formation with 5,350 ft. of diamond drilling in 1958 and recently announced plans to expend approximately \$250,000,000 upon plant, power, townsite, and transportation facilities.

In the base-metal field the American Smelting and Refining Company held reduced production of its Buchans operation at 285,000 tons for the year. Concentrates are shipped principally to European markets. Currently about 10% of all Canadian lead and zinc is provided by this one producer. Sinking of the new 14-ft. diameter circular concrete MacLean shaft, named for the company's late chief geologist, was advanced to within 1,500 ft. of its ultimate depth of 4,000 ft. during the year. Total production is now drawn from the Rothmere ore-body, the Lucky Strike and Oriental bodies having been mined out. Reserves are sometimes quoted at 6,000,000 tons. During the past field season this company placed 38 men comprising four parties in the field. Their activities, supported by helicopter and float plane, included AEM "ground checks," reconnaissance, and detailed geological and geochemical surveying of a total area of 950 sq. miles. Correlation between air and ground surveys within a gratifying accuracy of 200 ft. has been reported.

The newest copper producer in the Province is the Tilt Cove operation of Maritimes Mining Corporation which, since its mill turned over in August, 1957, has processed 1,999 tons per day. At the beginning of 1958 reserves were estimated at 3.7 million tons of 2.05% copper. "One of several new ore possibilities explored" during the year has indicated an additional 875,000 tons of 2.38% copper in what is termed the "Cove Zone." The

concentrates are transported to Noranda's smelter at Murdochville, Quebec, during an eight-month shipping season. The recent success of Maritimes is a credit to the diligence and perseverance of its operators. Here we have another illustration of ore remaining unknown to previous workers for the lack of adequate geological investigation and more ironically, it is said, for the lack of an additional 100 ft. of drilling. Newfoundland has many similar copper prospects awaiting detailed re-assessment.

Atlantic Coast Copper (an association of O'Brien Gold, Combined Metals, and New Highbridge) continued in 1958 to explore actively, by underground development from the recently completed 1,050 ft. shaft this copper property at Little Bay. Copper was first discovered at this site in 1877. Two million tons of 2-1% ore has been indicated by recent surface drilling.

Brinex, the exploration arm of the Rothschild-backed British Newfoundland Corporation, continued mineral investigation at approximately the same level as in preceding years. This company, by the very stature of its operations—the committed minimum expenditure of a quarter of a million dollars per year for a total term of 20 years which results in the average field season employment of 100 men—is making a major contribution to mineral exploration in this province. Paramount of their results to date is the Kitts Uranium Property, discovered in 1956 by Brinex prospector Walter Kitts at Monkey Hill 125 miles north-east of Goose Bay and one mile from tidewater. Here, extensive diamond drilling and underground work has outlined a zone of pitchblende, mineralogically similar to the Beaverlodge and Great Bear Lake deposits. The high grade of this material, plus its desirable access to transportation, assures its eventual production. Brinex has closely investigated large areas of its concession with geological and geophysical surveys and is concentrating work on both the Kaipokok-Makkovik and Hall's Bay-Bay of Islands areas. "Small but rich copper bodies" have been located on the company's island concession and exploratory diamond drilling is now being conducted in the White Bay-Notre Dame Bay region. The parent company's principal, and well publicized, project is the power development (of an estimated 6,000,000 h.p.) at Grand Falls. With the utilization of modern, long distance, low power loss, transmission methods, many areas of Eastern Canada, including the island portion of Newfoundland, may be expected to experience substantial economic benefit from this power production.

Of recent release is the statement by a notable member of this Association, Ross Toms, concerning additional 20% to 40% iron located in the northern Labrador portion of the Province, upon land optioned from the British Newfoundland Corporation. The result of further work by the Newfoundland Labrador Exploration Syndicate will be awaited with interest in many quarters.

Profisher, Ltd., continued to be active during 1958 and participated with Brinex in the mineral exploration of certain areas. Profisher holds under Development Licence an interesting columbium-beryl prospect, which could become of economic importance at some future date, a number of uranium prospects, and one promising copper occurrence all within its small concession area in East Central Labrador.

New Jersey Zinc conducted exploration upon Fee Simple Mining Grants on the island portion of

Newfoundland. Their application of geological mapping, prospecting, soil sampling, and X-ray diamond drilling found a number of new mineral showings but none proved to be of economic interest. In adjacent areas ground EM, self-potential, and magnetic surveys were also conducted.

Industrial mineral production in Newfoundland, presently restricted to the island, has made considerable progress in the past decade and the Province looks ahead to earning an even more significant position in this field. Of first importance has been the doubling of fluorspar production during this period, an accomplishment which was, unfortunately, depreciated by the termination of the St. Lawrence Corporation of Newfoundland operations in 1957. This property has not, in the face of Mexican competition, yet been revived. Total production in 1958 therefore originated solely from Newfoundland Fluorspar, which company effected plant and mine improvements and shipped 61,000 tons to its parent Aluminum Company of Canada plant at Arvida, Quebec. Currently the only other Canadian fluorspar operation is conducted in Madoc, Ontario, on a scale of approximately 1,000 tons per year.

Asbestos is of widespread occurrence throughout the many ultra-basic areas of the island. Of major significance are the recent developments in the Baie Verte region. Here, Canada's major asbestos producer, Canadian Johns-Manville, Patino of Canada, and others have consummated an agreement with Advocate Mines, Ltd. The optionees have until October, 1960, to further explore and test the area presently indicated by diamond drilling to contain 23,000,000 tons of varying fibre grades averaging \$10.00 per ton.

Three new industrial mineral operations have been established through the co-operation of the Newfoundland Government and, with the assistance of the Mineral Resources Division, as part of a programme aimed to diversify the Province's economy. Re-opening of the pyrophyllite quarry at Manuels, Conception Bay, by Newfoundland Minerals, Ltd. (a subsidiary of American Encaustic Tiling Inc.), was effected in 1956. Diamond drilling supervised by the Mineral Resources Division has since totalled 24,400 ft. and thus contributed to the production level of 7,000 tons of pyrophyllite attained in 1958. The processed material is shipped to Lansdale, Pennsylvania, to be utilized in the manufacture of ornamental tile. Currently new plant and shipping facilities are under construction. This deposit enjoys the distinction (and evokes much geological interest) of being the only pure pyrophyllite producer in the Dominion. The second industry is the operation of North Star Cement, Ltd., supplying approximately 500,000 barrels of cement per year to local construction trades. The Mineral Resources Division's geological mapping and supervision of diamond drilling has led to the development of large tonnages of low-magnesium limestone at Humbermouth, adjacent to the plant site. The shale requisite for the manufacture of cement is also quarried within the immediate area. The resultant production of these operations meets the highest standards of the American Society of Testing Materials and has been widely employed in U.S. Government defence construction on the island. The third operation is that of Atlantic Gypsum, Ltd., which produces 30,000 tons of gypsum per year from its modern, mechanized quarry at Flat Bay.

## Trade Paragraphs

**Dorr-Oliver Co., Ltd.**, of Norfolk House, Wellesley Road, Croydon, Surrey (Telephone: Municipal 2488), announce that they have moved their offices to this address from Wilton Road, London, S.W. 1. The Mechanical Engineering Division at Forest Hill is also moved to the new address.

**Allen West and Co., Ltd.**, of Brighton, issue a leaflet which describes a new plug-in master controller. Although developed to suit the requirements of the iron and steel industry it is suitable for other heavy industrial applications such as modern high-speed crane drives.

**William Rose, Ltd.**, of Lockfield Avenue, Brimsdown, Middx., draw attention to P.T.F.E. (polytetrafluoroethylene) all-purpose flexible hose. The material of which these hoses are made is described as a non-toxic inert thermoplastic which has a greater working temperature range than most plastics and is resistant to most chemicals.

**Rapid Magnetic Machines, Ltd.**, of Lombard Street, Birmingham, have issued a leaflet giving particulars of their non-electric permanent pulley-type separators. Constructed of Alcomax alloy magnet steel units the pulley is said to be unaffected by climatic conditions. It can be installed at the terminal head of existing or new conveyors and many applications are indicated, such as the removal of tramp iron.

**Morgan Crucible Co., Ltd.**, of Battersea Church Road, London, S.W. 11, have produced a number of illustrated brochures describing their products. These cover Birlec-Morgan electric die-casting furnaces (in association with **Birlec, Ltd.**, of Birmingham), oil-fired tilting furnaces, Morganite unit-type seals for pump packing, and Morganite carbon brushes for electric machinery. This last contains much information on carbon and the manufacture of the company's various grades and the uses for which they are suited.

**Du Pont Company (United Kingdom), Ltd.**, of 76, Jermyn Street, London, S.W. 1, announced last month that they have opened a new laboratory at Hemel Hempstead for development work on neoprene and other synthetic rubbers which is described as the Elastomers Research Laboratory and is the first such facility completed by Du Pont in Europe. At the same time it is pointed out that a neoprene plant nearing completion in Londonderry will, it is anticipated, materially increase the need for such service to the rubber industry.

**U.S. Rubber International (Great Britain), Ltd.**, of 62-64, Horseferry Road, London, S.W. 1, announce that Mr. Carroll J. Palmer has been appointed managing director as successor to Mr. R. D. Hunt, who at the beginning of the year became deputy managing director of the North British Rubber Co., Ltd., of Edinburgh and Dumfries. Mr. Palmer has come to his position in London following five years in Brazil as Director President of U.S. Rubber International do Brasil S.A., having begun his career with United States Rubber Company at the Providence Plant in Rhode Island, U.S.A., in 1936.

**E. Boydell and Co., Ltd.**, of Old Trafford, Manchester, now have available an extended lifting beam for their Muir-Hill loader designed to give greater scope in loading high-sided vehicles. The payload of this special model is restricted to 1,000 lb. Compared with the standard L.H.I, the lifting beam is extended by 15 in. providing an

increase of 11 in. in lifting height to the lip of a tipped 10.5-cu. ft. bucket. Therefore the maximum tipping clearance is 7 ft. 2 in. from the lip of the tipped bucket whilst the maximum reach at the maximum lifting height is increased to 19½ in.

**F. Perkins, Ltd.**, of Peterborough, issue some notes on a mine locomotive which has been working underground at President Steyn gold mine in the Orange Free State. The locomotive, which is shown in the illustration, is made by M. and R. Engineering



**Diesel-Engined Mine Locomotive**

Co., Ltd., of Johannesburg, and is fitted with a Perkins 46.5-b.h.p. L4 diesel engine running at 1,800 r.p.m. and giving a draw-bar pull of 5,000 lb. on test. A special feature of this equipment is that it is the first of its type in South Africa to demonstrate a torque converter complete with epicyclic gearbox transmission instead of the conventional plate clutch.

**Crofts (Engineers), Ltd.**, of Bradford, Yorks., have recently issued a number of new technical publications of interest to those concerned with power transmission. These cover Multispeed geared motor units and reduction gears for fractional to 1 h.p., worm-gear motors up to 5 h.p. and ratios of 5 to 1 to 60 to 1, combined spur and worm double-reduction geared motors up to 20 h.p., emergency slipping devices from fractional to 100 h.p. at 100 r.p.m., conveyor pulleys in diameters from 10 in. to 48 in. and face widths from 12 in. to 64 in., magnetic clutches and brakes, flexible and resilient couplings for transmissions up to 80,000 h.p. at 100 r.p.m., and timing belt drives suitable for drives up to 64 h.p. at 6,000 r.p.m.



**Simon-Carves, Ltd.**, of Stockport, and **Bruce Peebles and Co., Ltd.**, of Edinburgh, announce the signing of an agreement for the joint design and supply of electronic-pneumatic and electronic-hydraulic control and interlocking equipment for mine-car handling and skip-winding plant and other mining applications. A new approach to mining control problems, backed by the two companies with their wide combined experience of mining and electronic control, has resulted in the development of a completely contactless control system. The production of the new equipment, which is utterly reliable under the most adverse conditions, marks, it is suggested, a most important advance in control technique.

**Imperial Chemical Industries, Ltd.**, of Millbank, London, S.W. 1, from their Nobel Division have published a booklet entitled *Safety Fuse for Blasting*. This points out that the bulk of the world's manufacture of safety fuse is used in the metalliferous mining industry. Basically it consists of a core of specially prepared Blackpowder (Gunpowder) bound in with textiles to form a semi-fuse. Thereafter further textile counterings, varnishes, waxes, or other waterproofing coverages are added to afford protection against moisture, abrasion and other damages. A table gives a list of fuses with their applications and burning speeds in seconds per yard and another table gives the packings and lengths of coil. Various accessories for the proper use of fuse are described and illustrated.

**Hunting Aerosurveys, Ltd.**, of 6, Elstree Way, Boreham Wood, Herts., call attention to a new navigational aid. This enables the pilot of an aircraft to keep a continuous and accurate check on his position and is now being utilized for aerial survey work. The system, known as the Marconi Doppler Navigator, operates entirely independently of any ground stations. It takes its name from the Austrian scientist who discovered the principle over 100 years ago and means that survey aircraft can operate as entirely self-contained units over the most featureless and un-mapped areas. The company also issue an

information sheet which gives details of aerial survey contracts in the years 1957 and 1958, including eight for oil and mineral exploration in Angola, Burma, Italy, Kenya, Libya, Northern and Southern Rhodesia, and Devon and Cornwall.

**Ruston and Hornsby, Ltd.**, of Lincoln, in the latest issue of *Ruston Review*, include a description of a new addition to their locomotive range. This is the class LB which is available in two models for surface haulage and underground use respectively. The new locomotive supersedes the company's earlier series and is equipped with an air-cooled 31.5-b.h.p. engine and is suitable for gauges from 1 ft. 6 in. to 3 ft. 6 in. and available in two weights,  $3\frac{1}{2}$  and  $4\frac{1}{2}$  tons with 2 or 3 speeds in either direction. The choice of ratios for both the 2 and 3-speed machines enable the maximum utilization of power to meet most haulage conditions and speeds. With the  $4\frac{1}{2}$ -ton locomotive the tractive effort in bottom gear is 560 lb./ton and the adhesive weight is 2,520 lb., the stall tractive effort being considerably greater. The following examples give a good indication of the locomotive's performance. With plain bearing wagons 50 tons can be hauled against a gradient of 1 in 200 or 21 tons against a 1 in 20 gradient at 5.8 m.p.h.

**Libu Shovel Co., AB.** of Stockholm (British representatives: Libu Shovel Co. (Great Britain), Ltd., of Amersham Common, Bucks.), make available some further particulars of their side-tipping bucket mentioned in the February issue. This is really a three-way dump bucket, since it can tip both to left and right as well as forwards and is designed for use with Caterpillar Traxcavators Nos. 977, 955, and 933. All buckets have plough-formed cutting edges made of Bofors steel, the volume being the same as of the corresponding conventional buckets. They are tippable at every height on a conveyor system, on trucks, and on dumpers. The makers point out that in rock loading bigger lumps can be handled because of the bucket shape (as may be seen in the illustration) and refer to the advantages that it has in underground work



**Libu Shovel Co.  
Side-Tipping  
Bucket**

in eliminating the need for a rearward dumping loader. In many cases it also supersedes another loading method—that of backing out of the tunnel or to a turn-round point specially made in the rock in order to bring a forward-tipping loader into its dumping position.

**Denver Equipment Co.**, of Denver, Colorado, (London office: 15-17, Christopher Street, E.C. 2), in a recent note refer to some of the largest propeller agitators ever supplied to the mineral and chemical processing industries. Recently shipped to West Africa, the agitators, 23 of them, are destined for an alumina plant; 17 have 96-in. diameter propellers and will operate in tanks of 21 ft. diameter by 20 ft. deep. Coarse heavy bauxite ore slurry is to be handled and this is the first installation involving the use of propeller agitators for the digestion of alumina from bauxite ores as coarse as 8 mesh. They were selected by the French company, operating the plant, after studying the methods used by uranium processing plants in the United States where similarly difficult agitation problems are encountered. In another note the company give some details of the new worm-gear drive developed for propellers up to 120 in. diameter for tanks up to 50 ft. diameter by 40 ft. deep to provide an agitation mechanism powerful enough and properly designed to withstand the cantilever loading imposed. It makes possible positive propeller agitation, suspension, mixing, or conditioning in large tanks, such as slurry holding and mine backfilling and has been successfully used in heavy magnetite suspension problems and large mesh alumina holding, as well as potash conditioning and uranium leaching and extraction processes. Propellers may be of standard or rubber-covered construction.

#### Correction

It is regretted that the second paragraph of an announcement regarding the activities of the LeTourneau-Westinghouse Co., of Peoria, Illinois, which appeared on p. 314 of our May issue, was by mistake added to a note on the Caterpillar Tractor Co., Ltd., on p. 317. The paragraph referred to a new 360-h.p. Model B. Tournapull.

#### RECENT PATENTS PUBLISHED

A copy of the specification of the patents mentioned in this column can be obtained by sending 3s. 6d. to the Patent Office, Southampton Buildings, Chancery Lane, London, W.C. 2, with a note of the number and year of the patent.

**9,086 and 16,452 of 1945 (812,793-4).** M. D. KAMEN and A. DE HAAN. Recovery of uranium.

**35,217 of 1954 and 24,517 of 1955 (812,891-2).** T. R. NAYLOR. Hydrocyclone design.

**14,450 of 1955 (812,817).** SOLAR AIRCRAFT CO. Electrolytic production of titanium.

**226 of 1956 (813,269).** COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION. Extraction of uranium.

**10,269 of 1956 (812,702).** BERYLLIUM CORPORATION. Method and Apparatus for the continuous production of metallic beryllium.

**18,184 of 1956 (813,810).** FLOATEX SEPARATIONS, LTD. Sand cones.

**24,029 of 1957 (813,027).** N. J. D. NILSON and A. HOLMBERG. Process and apparatus for sintering ores, concentrates, etc.

#### NEW BOOKS, PAMPHLETS, ETC.

Publications referred to under this heading can be obtained through the Technical Bookshop of *The Mining Magazine*, 482, Salisbury House, London, E.C. 2.

**The Chemistry of Manganese Deposits.** By W. R. FROST. Canad. Mines Branch Research Report R 8. Paper covers, typescript, 125 pages. Price 25 cents. Ottawa: Dept. of Mines and Technical Surveys.

**Optical Mineralogy.** By PAUL F. KERR. Third edition. Cloth, octavo, 442 pages, illustrated. Price 66s. London: McGraw-Hill Publishing Co., Ltd.

**Review and Evaluation of Methods of Particle Size Analysis:** Part 1, The Definition of Terms and Classification of Sizing Methods; Part 2, Sieve Analysis. By R. F. PILGRIM. Canad. Mines Branch Inform. Circ. IC 106. Paper covers, typescript, 85 pages. Price 25 cents. Ottawa: Dept. of Mines and Technical Surveys.

**The Elution with Carbonate Solution of an Ion Exchange Resin Loaded with Uranyl Sulphate.** By V. M. McNAMARA and W. A. GOW. Canad. Mines Branch Res. Report R 41. Paper covers, typescript, 15 pages. Price 25 cents. Ottawa: Dept. of Mines and Technical Surveys.

**Rapid Analysis of Chromite and Chrome Ore.** By J. I. DINNIN. U.S. Geol. Surv. Bull. 1084-B. Paper covers, pp. 31-68. Price 20 cents. Washington: Superintendent of Documents.

**Annotated Bibliography on the Geology of Selenium.** By G. W. LUTTRELL. U.S. Geol. Surv. Bull. 1019-M. Paper covers, pp. 867-962. Price 50 cents. Washington: Superintendent of Documents.

**Classification, Delineation, and Measurement of Nonparallel Folds.** By J. B. MERTIE. U.S. Geol. Surv. Prof. Paper 314-E. Paper covers, pp. 91-124. Price 30 cents. Washington: Superintendent of Documents.

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## Selected Index to Current Literature

This section of the Mining Digest is intended to provide a systematic classification of a wide range of articles appearing in the contemporary technical Press, grouped under heads likely to appeal to the specialist.

\* Article in the present issue of the MAGAZINE.

† Article digested in the MAGAZINE.

### Economics

**Exploration, Canada:** *Symposium, Toronto.* Prospectors' Issue. *Canad. Min. J.*, Apr., 1959.

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\***Production, Mexico:** *Iron, Durango.* Cerro de Mercado, Mexico. M. S. ALBANS, *THE MINING MAGAZINE*, June, 1959.

\***Production, United Kingdom:** *Anhydrite, Durham.* The Billingham Mine To-day. *THE MINING MAGAZINE*, June, 1959.

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**Production, World:** *Beryllium, Review.* Beryllium. T. H. H. SKEET, *Mine, Quarry Engg.*, June, 1959.

**Resources, Australia:** *Iron, Tasmania.* The Savage River Iron Deposits. A. NELSON, *Mine, Quarry Engg.*, June, 1959.

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**Economic, United States:** *Quartz, Carolina.* Quartz Crystal Deposits of Southwestern Virginia and Western North Carolina. J. B. MERTIE, *U.S. Geol. Surv. Bull.* 1072-D.

**Economic, United States:** *Radioactivity, Colorado.* Radioactivity and Uranium Content, Sharon Springs Member of the Pierre Shale. E. R. LANDIS, *U.S. Geol. Surv. Bull.* 1046-L.

**Economic, United States:** *Radioactivity, New Jersey.* Radioactive Rare-Earth Deposit at Scrub Oaks Mine, New Jersey. H. KLEMIC and others, *U.S. Geol. Surv. Bull.* 1082-B.

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**Regional, Canada:** *Bay of Islands, Newfoundland.* Bay of Islands Igneous Complex. C. H. SMITH, *Canad. Geol. Surv. Mem.* 290.

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**Belting, Conveyor :** *Performance, Gauging.* Assessing the Performance of Conveyor Belting. L. T. HEMS, *Trans. Instn. Min. Eng.*, May, 1959.

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**Coal, United States :** *Content, Ash.* Evaluation of an Acid-Extraction Method for Determining the Mineral Matter in American Coals. E. C. TARPLEY, W. H. ODE, *Rep. Inv. U.S. Bur. Min.* 5470.

\***Concentration, Gravity :** *Tables, Shaking.* The Shaking Table. Ore-Dressing Notes, *THE MINING MAGAZINE*, June, 1959.

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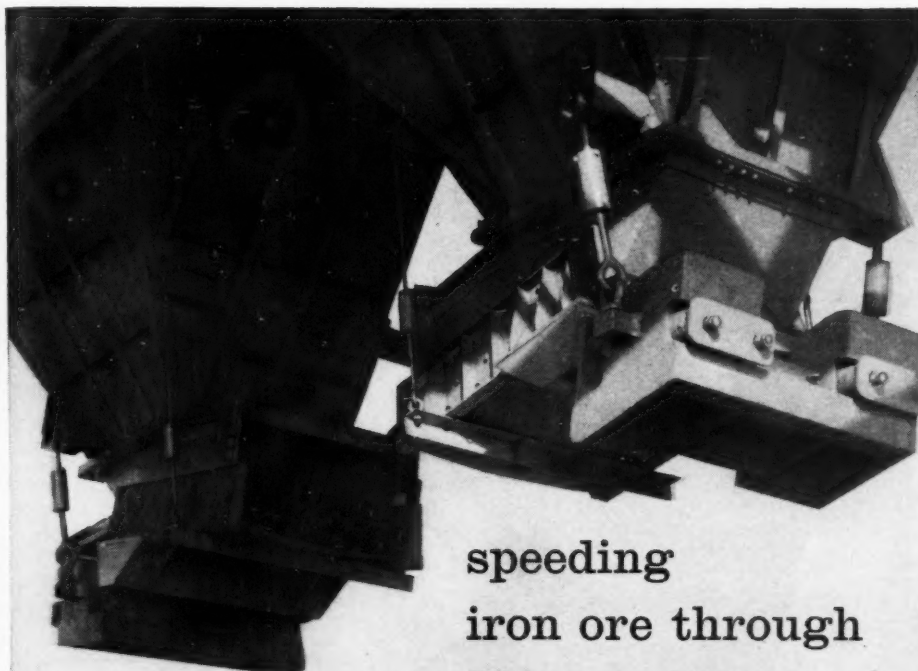
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**General, Brazil :** *Phosphate, Pernambuco.* How Fosforita Olinda S.A. Processes Brazilian Phosphate. W. H. EVANS, *Engg. Min. J.*, May, 1959.

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**General, United Kingdom :** *Coal, Yorkshire.* Manvers Central Coal Preparation Plant. W. G. HARPER, *Deco-Trefoil*, Mar.-Apr., 1959.





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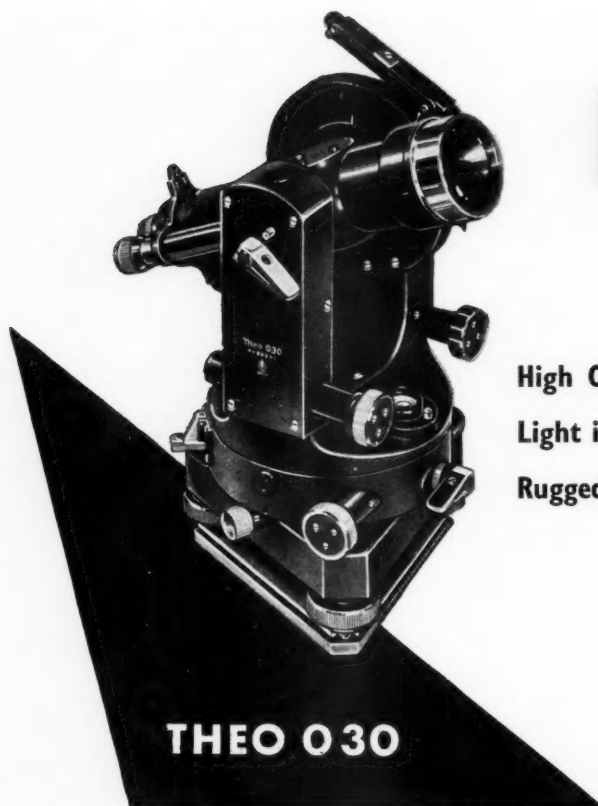
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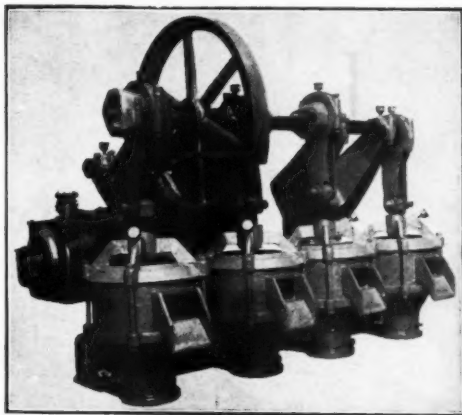
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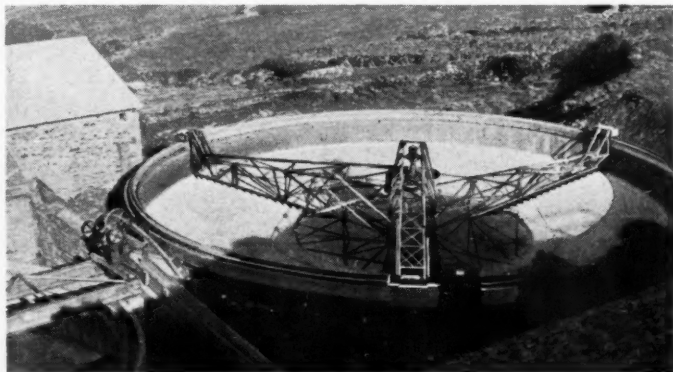
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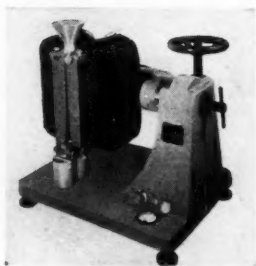


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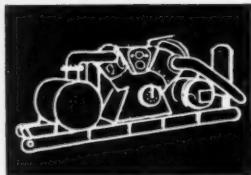
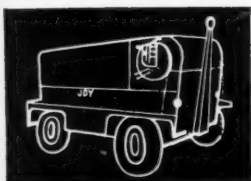
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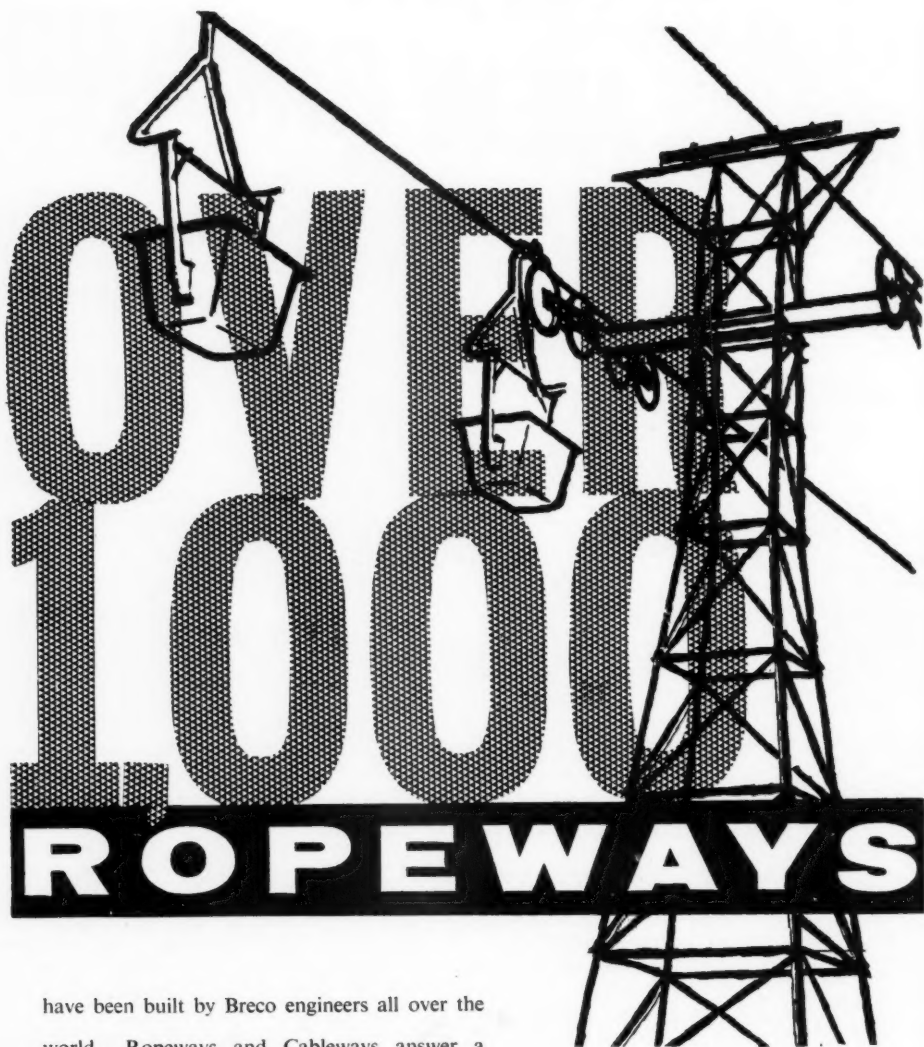
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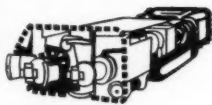
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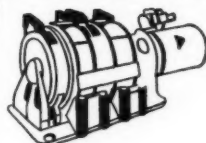
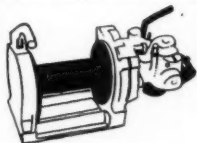
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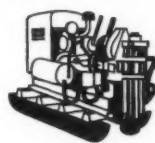
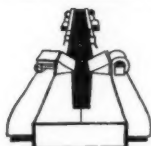
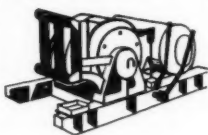
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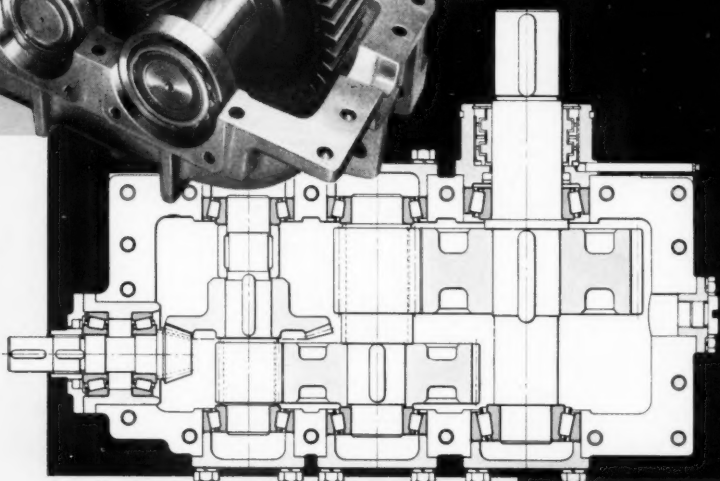
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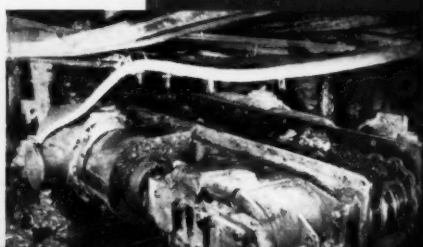
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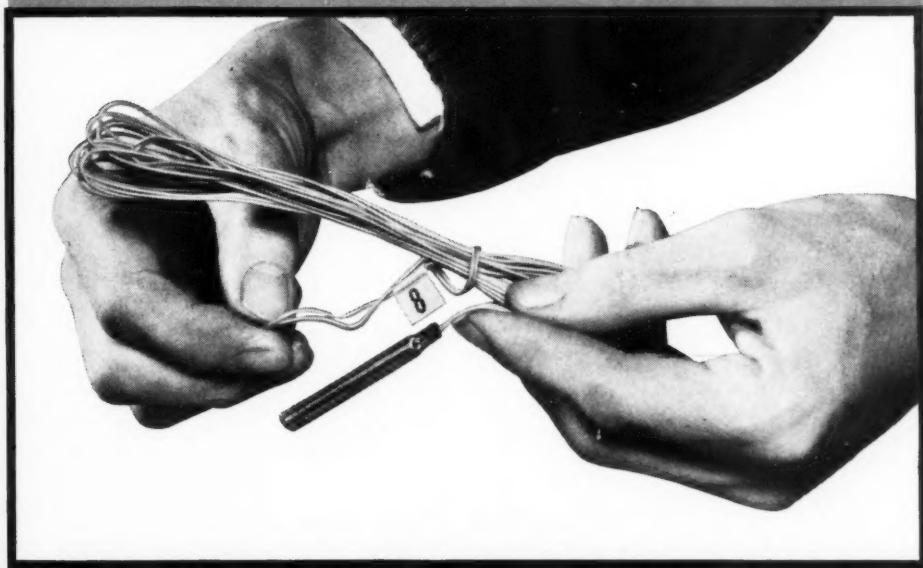
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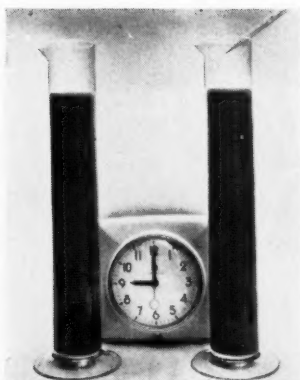
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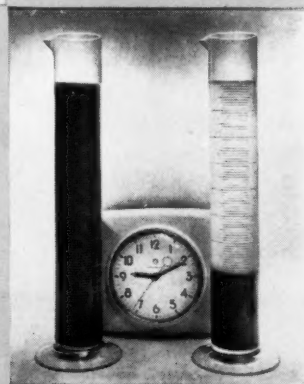
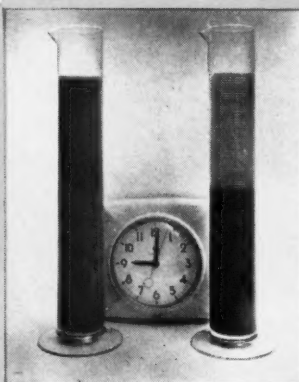
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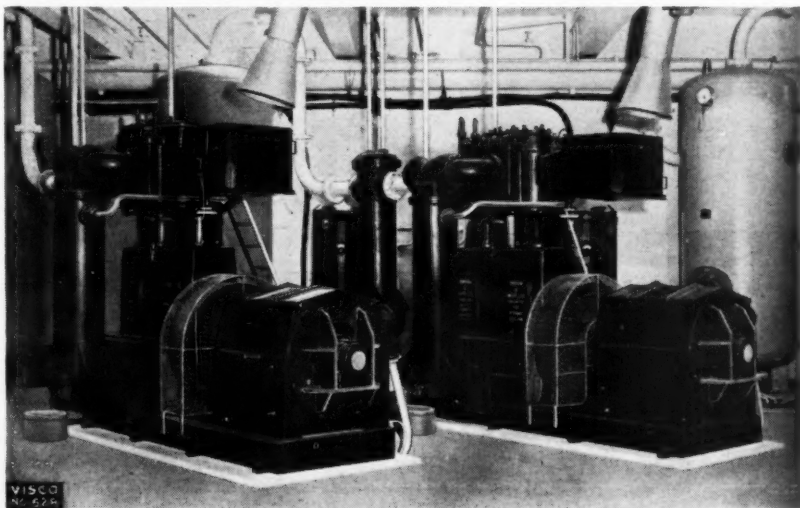


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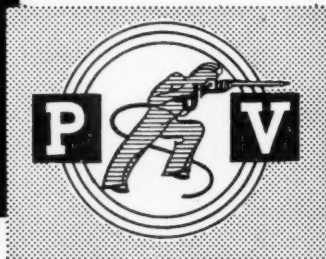
Coupled Drill Rods

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The P. & V. "RIPLOY" Range of Percussive Rock Drill Bits and Rods have been proved in drilling operations on sites distributed throughout the world. Their development has been shaped by the widely varying and exacting conditions which are met over such an extensive area. Among the "RIPLOY" Range can be found the precise tool accessory you require to fit your conditions, backed by the fine Technical Service rendered by P. & V. No matter where you may be operating there are supplies and service waiting to serve you. Remember the name "RIPLOY" when your requirements are for Percussive Bits and Drill Rods.



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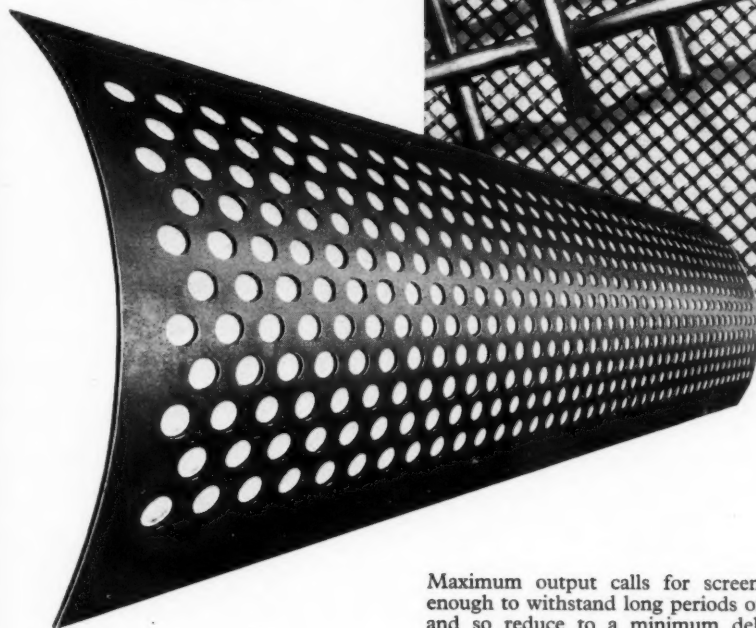
Proprietors of "RIP BITS" Ltd., Sheffield.

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**MAXIMUM**  
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Maximum output calls for screens that are tough enough to withstand long periods of gruelling service, and so reduce to a minimum delays for repair or replacement. In fact maximum output calls for

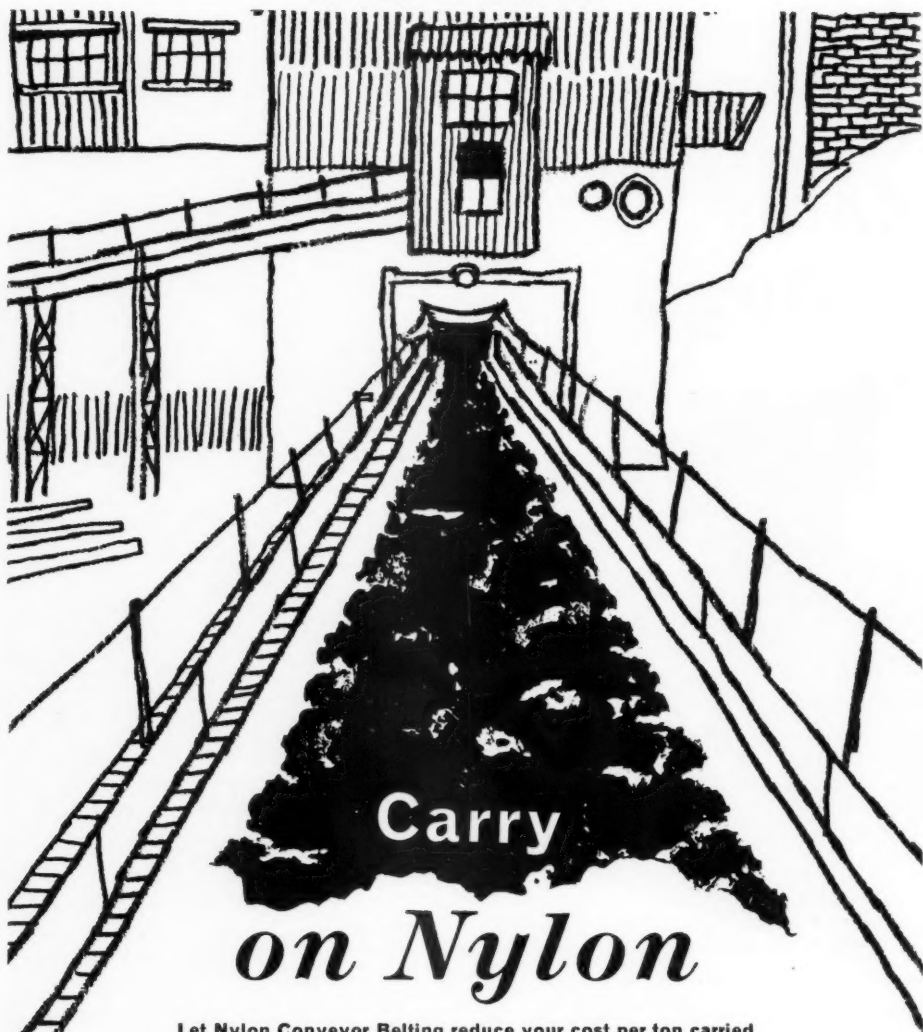
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Supplied as flat or curved plates, or as complete screens to specification, in a wide range of gauge, mesh and pattern for every screening, sorting or sizing requirement.

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**Let Nylon Conveyor Belting reduce your cost per ton carried**

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Visit the B.N.S. Stand No. 128 where our textile experts will be in attendance



**it's Nylon for strength**

\* Nylon Conveyor Belts are in daily use in Coal Mines, Open Cast Coal Mines, Quarries, Electricity Generating Stations, Sand and Gravel Pits, Brickworks, Iron and Steel Works

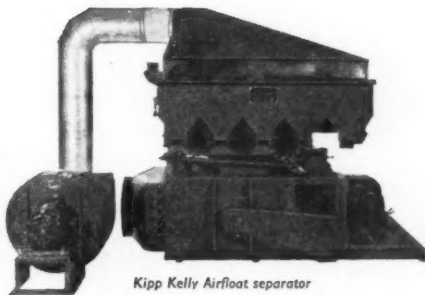


**KIPP KELLY**

# AIR-FLOAT SEPARATOR

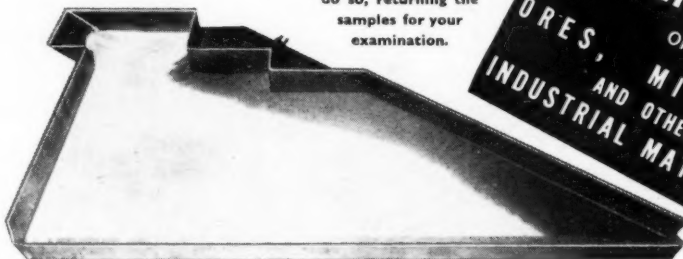
Dry concentration has many advantages over wet methods except when water is actually required as a solvent or when wet working is needed prior to producing a separation. Consider these advantages :

- Produces higher grade product with less loss than is possible by wet concentration.
- Dry concentration plants may be located anywhere, regardless of water supply. No water to pump or bring from a distance, thereby eliminating that cost.
- Increased capacity cuts down number of units and space necessary, resulting in smaller and less expensive plants with low power costs.
- Due to the greater sensitivity to slight differences in density of the particles, Dry Concentration will successfully treat ores which are not amenable to wet concentration.
- Ore may be efficiently separated at the economical releasing point of the minerals.

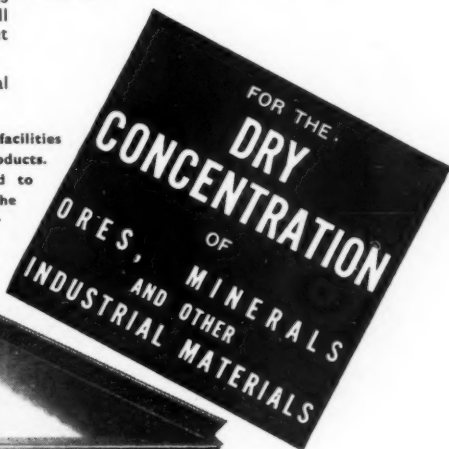


*Kipp Kelly Airfloat separator*

We have Laboratory facilities for testing your products. We will be pleased to do so, returning the samples for your examination.



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the valves also for scores of simple duties.

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INDUSTRY



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*the ultra lightweight rotary drill*

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"Muraflux A" is the first of a new range of Murex granular fluxes for submerged-arc welding. It has been specially developed for the welding of mild steel by all machines using A.C. or D.C. for submerged-arc welding.

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## SINK-AND-FLOAT ore concentration plants

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**Mining Costs** by providing cheap stope fill

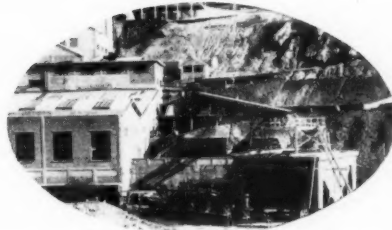
**Milling Costs** by eliminating hard sub-economic mined rock

### INCREASE

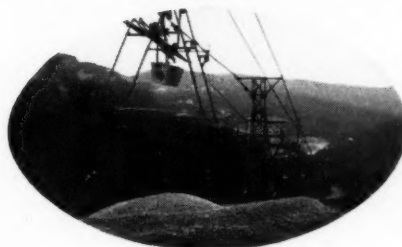
**Concentrates Output** by more efficient recovery

**Ore Reserves** by pre-concentrating lower grade ore

1,900 TONS PER DAY  
OF MINE ORE



750 TONS PER DAY  
OF STOPE FILL



At the Montevecchio lead-zinc mine in Sardinia these HH sink-and-float plants treat 1,900 tons per day of run-of-mine ore, rejecting 750 tons per day of coarse tailings as stope fill.

*Ore concentration plants by*

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- ★ HIGHER LIFTS
- ★ LONGER CENTRES

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- ★ Outstanding troughability.
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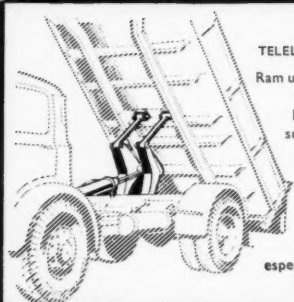
World famous for: Oil, Air, Steam and Water Hose • PowerGrip Timing Belts • Dock Fenders • Expansion Joints

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# 24

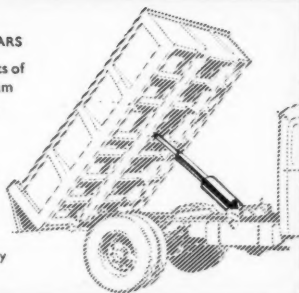
TELEHOIST TIPPING  
GEARS TO CHOOSE FROM!

Whatever the truck, wheelbase, capacity . . . or job . . . Telehoist have a tipping gear made for it! The complete Telehoist range covers four basic types of tipping gear and includes 24 separate models. One model of each type is illustrated below.



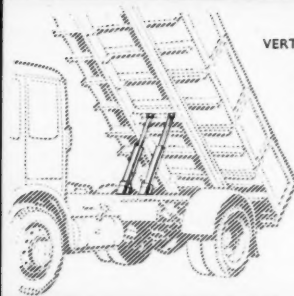
## UNDERBODY TELELEVER TYPE GEARS

Ram units combined with robust 'Telelever' linkage mechanism, suitable for payloads from 5 to 15 tons according to the type of chassis. These gears provide great stability, especially when tipping on uneven ground.



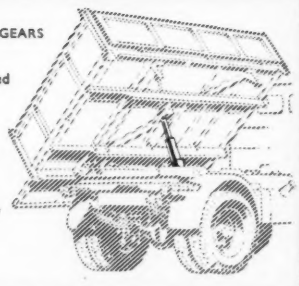
## UNDERBODY SLANT TYPE GEARS

This range consists of single and twin ram gears suitable for payloads from 5 to 10 tons. Telehoist slant type gears are specially designed to provide maximum stability during tipping.



## UNDERBODY VERTICAL TYPE GEARS

Twin vertical ram gears for payloads from 8 to 12 tons, where a lower loading line is desirable. Suitable for use with a wide range of chassis.



## UNDERBODY 3-WAY TIPPING GEARS

Single and twin ram units mounted centrally to give 3-way tipping movements for chassis from 4 to 12 ton payload. Specially designed for tipping in tight spaces.

## the trend is to TELEHOIST

tipping gear and all-steel bodies. If you would like complete details of the full range of Telehoist tipping gears and specific information on the gear best suited to the type of work you have in mind, please post this coupon.

## Telehoist Limited

an associate company of Wilmot Breeden Ltd., are at Manor Rd., Cheltenham. Tel: Cheltenham 53254 Upper Brook St., Manchester, Tel: Ardwick 6251

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Tipping Gears and bodies suitable for a

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..... (wheelbase) ..... (capacity)

The nature of the work will be .....

Name .....

Address .....

MM2 .....



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TILTING  
CONCENTRATOR**



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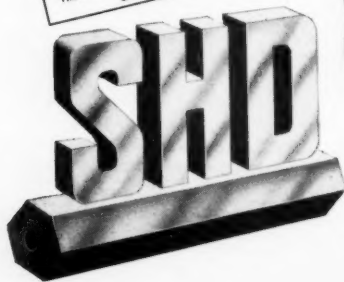
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SAND, EIGHT HUNDRED AND SIXTY THREE  
FEET IN APPROXIMATELY 7½ MONTHS.

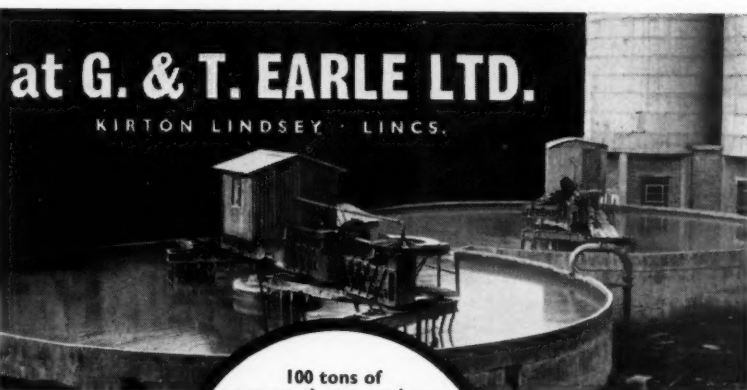
**THE SHEFFIELD HOLLOW DRILL STEEL Co. Ltd.**

**CARBROOK ROLLING MILLS, CARBROOK, SHEFFIELD, 9**

TELEPHONE: 41377 (3 lines)

TELEGRAPHIC ADDRESS: HOLLOW, SHEFFIELD

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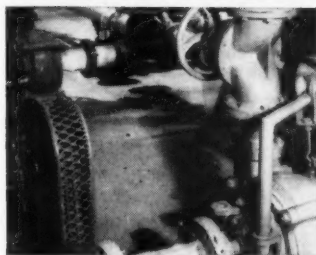
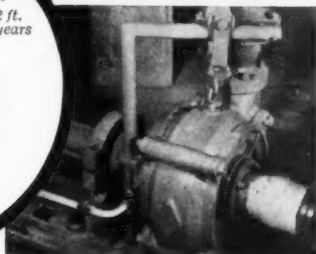
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P.62(M)

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THE MINING MAGAZINE

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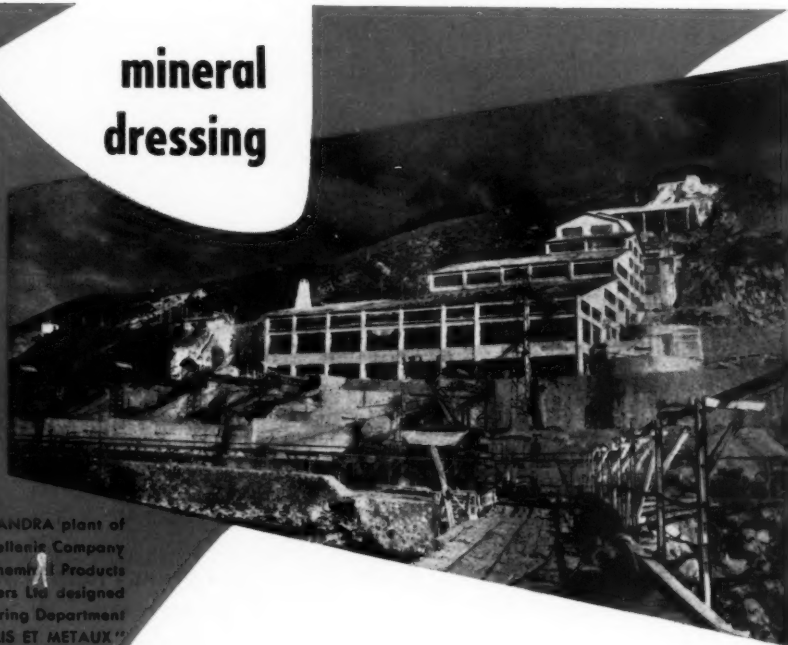
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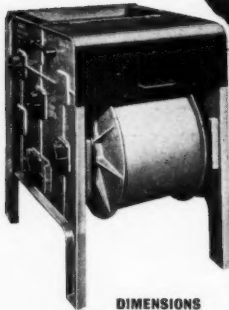
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- Electric Feeder to magnet drum giving even distribution with feed rate control.
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- All working parts and electrics totally enclosed giving full protection to the operator.
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- Easily transportable.

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Overall Dimensions: Height. 37" Width. 31" Depth. 34"  
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Nett Weight: 950 lbs. Boxed: 1100 lbs. 37 cu. ft.  
H.P. Drive 1. Total Input: 600 watts.  
Distance flange of drum to ground: 12½".

**DAVIES  
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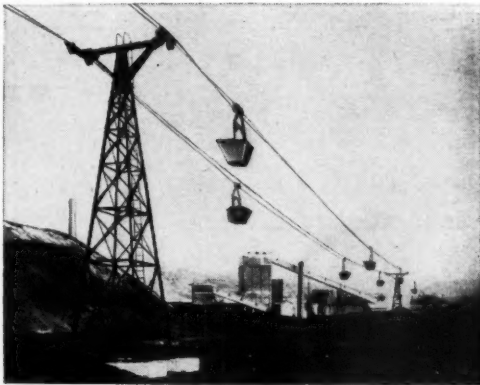
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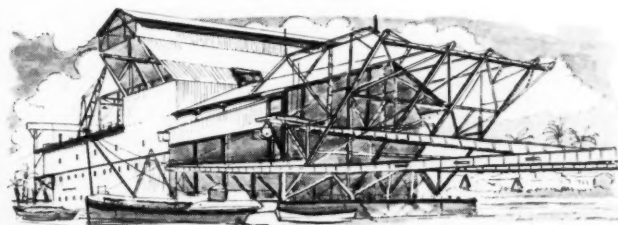


Whatever the future holds in store for our producers - the call will increasingly be for efficient equipment, giving maximum output at the lowest possible level of operating cost.

Only modern machinery and up-to-date working methods can assure the best results. As for alluvial mining the success of your operations depends on the earning power of

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You are wise to look into that matter, now! Contact the builders who are specialists in the construction and re-fitting of dredgers; I. H. C. Holland.



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THE MINING MAGAZINE

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- MAX**: A high capacity roller bearing.
- SL**: A solid & flexible roller bearing.
- GPK**: A double row self-aligning barrel roller bearing pillow block.
- RFX**: A solid & flexible roller bearing.
- ST**: A single and double row ball bearing incorporated in a Limberoller flexible belt conveyor idler.
- PU**: A double row self-aligning ball bearing pillow block with one-piece cast iron housing.
- FPS**: A sealed-for-life ball bearing for conveyor rollers, castors and wheels.
- RFX**: A roller bearing for axle boxes.
- LTR**: A double row, self-aligning ball bearing pillow block with split cast iron housing.

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'Max-Load' high capacity roller bearings—CATALOGUE MAX  
 Solid & Flexible roller bearings—CATALOGUE RFX

Double row self-aligning ball bearing pillow blocks with one-piece cast iron housings—CATALOGUE PU

Double row, self-aligning ball bearing pillow blocks with split cast iron housings—CATALOGUE LTR

Double row self-aligning barrel roller bearing pillow blocks with split cast steel housings—CATALOGUE GPK

Roller bearings for axle boxes—CATALOGUE RFX

Single and double row ball bearings incorporated in 'Limberoller' flexible belt conveyor idlers.

Sealed-for-life ball bearings for conveyor rollers, castors and wheels, etc. Ref. FPS.

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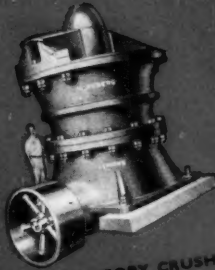
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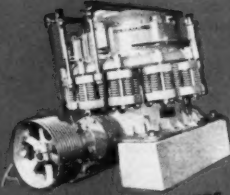
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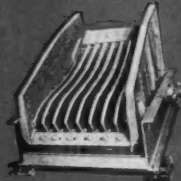
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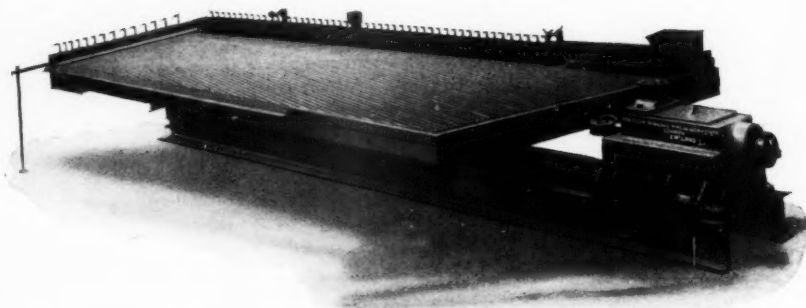
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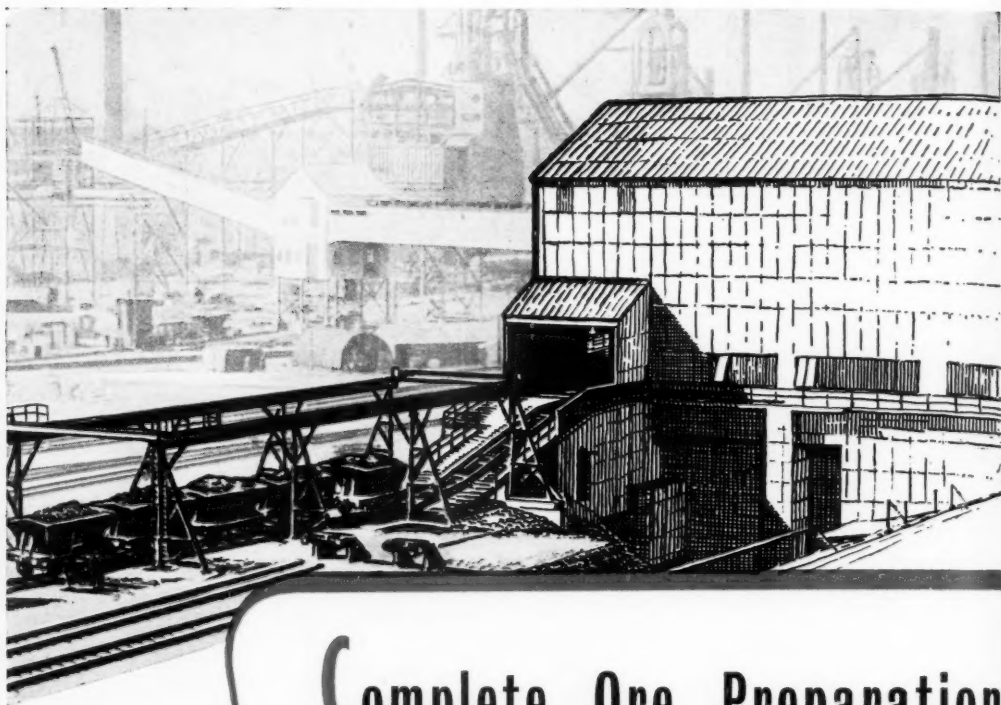
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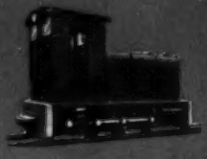

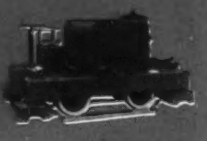














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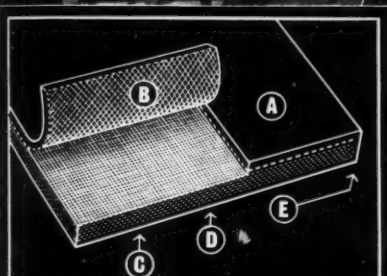
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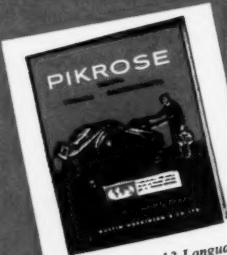


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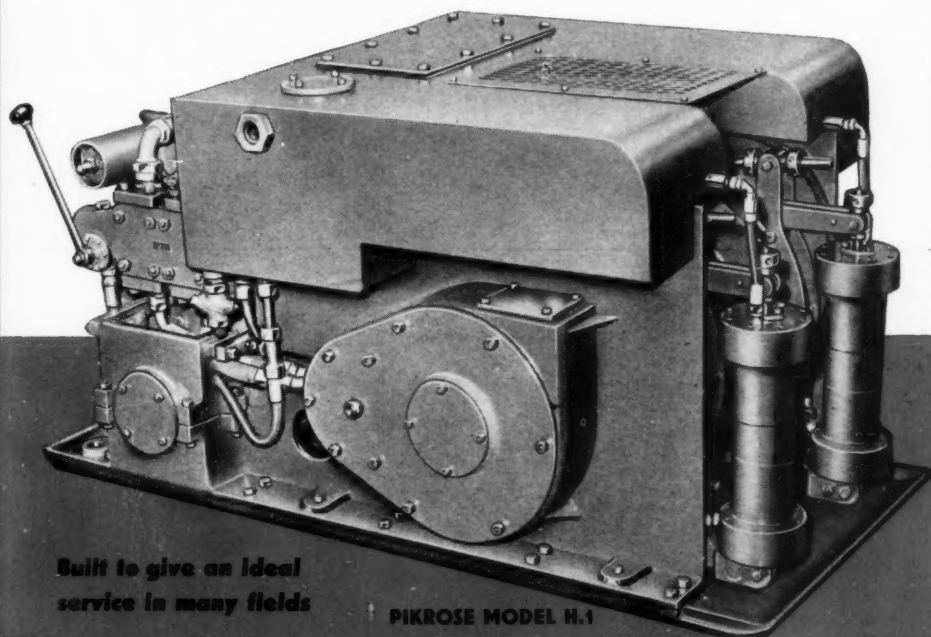
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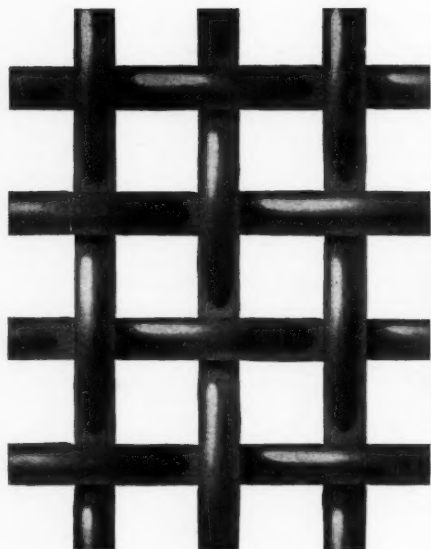
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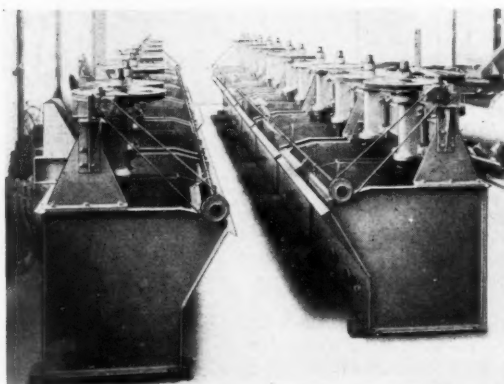
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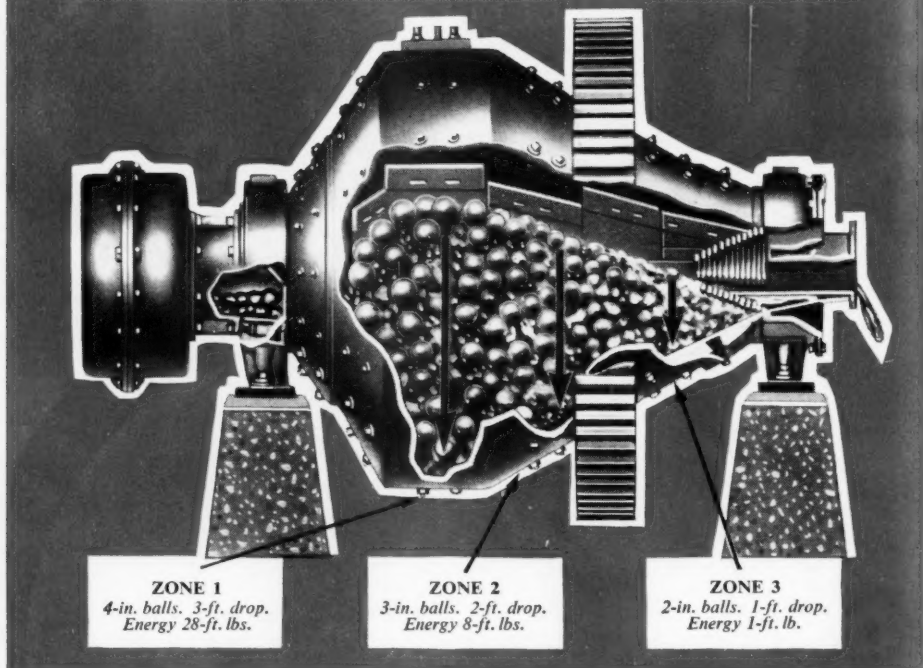
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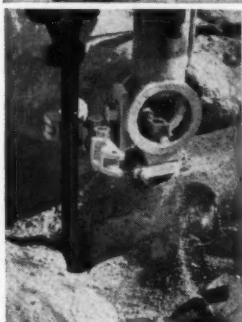
Atlas Copco manufacture portable and stationary compressors, rock-drilling equipment, loaders, pneumatic tools and paint-spraying equipment. These are sold and serviced by companies or agents in ninety countries throughout the world.

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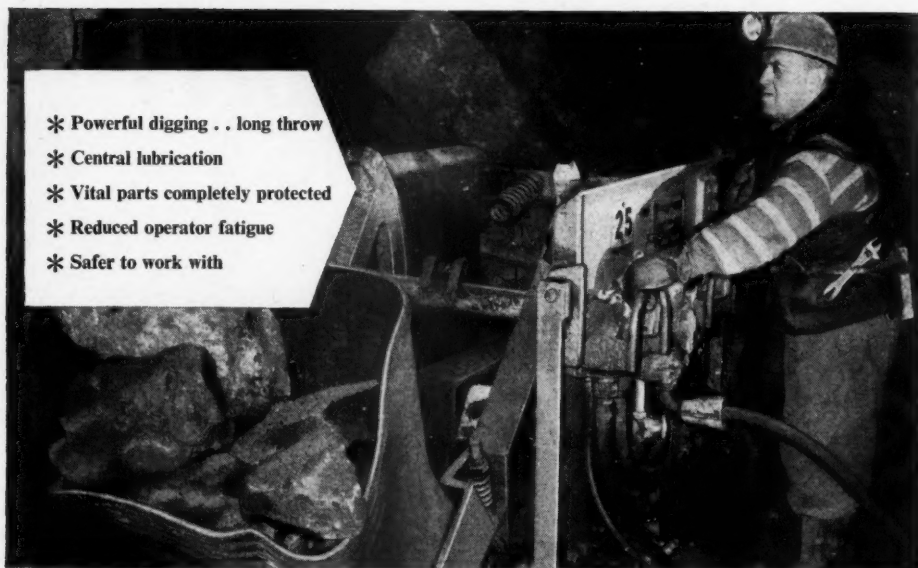


One man can easily operate two Benchers simultaneously.



To secure the rig, bolt holes are drilled and anchor bolts and wedges placed in and driven tight. The bencher is placed on the heads of the anchor bolts and the feed is locked at the desired angle with chained wedges.

The operator can easily drill additional bolt holes while the rock drills already set up are running.



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LM56 is not affected by the water and dirt that surround it underground. The vital parts are completely protected by special sealings, and the amply proportioned gears are made to withstand the stresses of rough work. That is why it gives long and reliable service under the toughest conditions.

### **Special silencers and new controls reduce operator fatigue**

LM56 is remarkably silent running and easily operated. Each motor is fitted with a separate absorption silencer enclosed in the gear box.

*Loading capacity is commonly given as theoretical capacity, obtained by multiplying the loading cycle with the bucket capacity. Such ideal conditions may conceivably be approached when loading sand or gravel. The capacity of LM56 is a realistic average obtained from numerous time studies of ore loading under normal working conditions.*

Smooth working air controls, of a completely new design, are also fitted with special silencers.

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## COMPANY MEETINGS AND REPORTS SECTION

CHAIRMAN'S STATEMENT: ANGLO AMERICAN CORPORATION OF SOUTH AFRICA LIMITED

(Incorporated in the Union of South Africa)

### Racial Policies in Southern Africa

#### MR. H. F. OPPENHEIMER REVIEWS ANGLO AMERICAN CORPORATION'S DEVELOPMENTS AGAINST POLITICAL BACKGROUND

#### CONFIDENCE IN FUTURE OF UNION AND FEDERATION IN SPITE OF DANGEROUS PROBLEMS

*The following are extracts from the statement by the chairman, Mr. H. F. Oppenheimer, which has been circulated to members:*

THE Anglo American Corporation is rooted in Southern Africa. We would certainly be prepared to do business in other parts of the world, but other things being equal we prefer to do business here. And, in fact, all but a negligible proportion of our investments have been made in the Union and the Rhodesias. We are conscious, of course, that many people are worried about the ultimate effect of the racial policies followed in the Union, that the disturbances in Nyasaland have raised grave doubts about the future of the Federation, and that for these reasons the economic growth of both countries has slowed down. In the circumstances I think that shareholders would wish me to say something of the political environment.

The Union and the Rhodesias have comparatively large European populations with no other homes. They are determined to stay in Southern Africa and to create conditions in which their children and grandchildren can stay there also. Any political approach which does not accept that fact is unrealistic and useless. Nyasaland is different from the other territories. It is an African country with a very small European population. The question there is not so much of building up a multi-racial country but rather of finding a fair way for an African territory to be associated with multi-racial territories in one political system. Apparently there are African nationalist leaders who think any such association intolerable and seek to destroy it by methods of violence. The overwhelming economic advantages of Federation are summarily rejected in favour of what is called "freedom," regardless of the danger that the course they pursue would mean years of poverty and stagnation for the vast majority of the population.

Nevertheless, whatever the material benefits of the association to Nyasaland, it is plainly not going to be workable unless the policy of partnership is honestly and intelligently implemented not only by the Government but by individuals in the daily life of the two Rhodesias. It is not going to work either unless African opinion and aspirations in each of the federated territories are fairly represented in the central Government.

#### Racial Partnership

The question that must be answered is whether the Federal Government and Europeans in the Federation as a whole are sincere in the racial policy they profess. I am convinced they are. Criticism is easy, particularly for those without first-hand knowledge of the situation; but I think that any person with experience of conditions and prejudices in Southern Africa and an understanding of the dangers implicit in the racial situation will give the Federal Government credit for a real desire to implement the racial partnership envisaged when the Federation was founded and for proceeding with courage and determination and as much speed as in the circumstances has been practical.

It is particularly encouraging that Europeans in Rhodesia are not allowing the violence and folly that have been manifested in Nyasaland to destroy their faith in the possibility of inter-racial co-operation or weaken their determination to do their part in securing it. What has happened has, at least to my mind, made it clear that when the time comes to make changes in the present constitution it will be essential to devise safeguards to ensure that neither the present European majority nor a possible future African majority would be able to enact unfair legislation on racial grounds. It is this understandable mutual fear which constitutes the chief bar to the confident and fruitful co-operation of the races that all reasonable people want to see.

#### Problem in the Union

As compared with the Federation, the Union has the advantage of a much larger European population. The Union, unlike the Federation, is making no serious effort to strengthen its European population by immigration, but in spite of that even the most fervent African nationalist knows that the Union cannot be turned into an exclusively African country. Indeed, in the Union all thinking Africans and Europeans know very well that the question that must be answered is not whether South Africa should be a multi-racial state but rather how such a state should conduct its affairs.

In these circumstances, it ought to be easier in the Union than elsewhere to find the way to inter-racial co-operation. Nor should a justified concern at certain unfortunate aspects of race relations in the

Union be allowed to blind us to the fact that considerable progress has been made. The economic expansion of the country has benefited all races and the standard of living of Africans, which is still far too low, has risen rapidly—indeed, more rapidly than that of the Europeans. It seems to me that too little recognition is given to this improvement, in the material well-being of all races which has taken place since the end of the war, and to the significant changes in thinking of a large cross-section of the public of the Union during the past year.

Most Europeans in South Africa now realize that in due course the Africans must obtain a share in the government of the country. The differences between parties do not turn on whether or not Africans should have greater civic rights but on whether reasonable African aspirations can or should be satisfied by the grant of autonomy in their tribal areas or whether, on the other hand, they must receive a share in the central government of a united country. The Government has emphasized its desire to develop the tribal areas to the full—economically, socially, and politically. This, in itself, is highly desirable. It is important that it should be clearly understood, both by its opponents and its followers, that the Government's policy of *apartheid* has a positive as well as a negative aspect.

On the economic side the idea that the tribal areas should be developed in separation from the rest of the country is, I am sure, both impractical and dangerous, but the fact remains that the economic development of the reserves has lagged far behind and needs to be energetically tackled.

On the political side it may perhaps seem strange, after what has happened in the North, that the South African Government should deliberately set about creating autonomous African territories whose relationship to the rest of the Union would seem in many ways analogous to the relationship of Nyasaland to the rest of the Federation. Nevertheless, I am convinced that the policy of building up machinery of local self-government in the tribal areas is wise.

Obviously, however, it is only a beginning. There has been some talk of eventual full independence for the African areas, but I do not believe that South Africans of any race or party would seriously contemplate the partition of the country. And it is surely plain that autonomous African territories will never accept membership with Europeans in one political system unless they can at least look forward to a fair share in the central government of the whole system. The development of local self-government for Africans in the tribal areas and the granting to Africans of a part in the central government are not opposed but complementary conceptions.

Then it must be remembered that the policy of local African autonomy leaves untouched the question of the political future of the millions of Africans who do not live and never will be able to live in the tribal areas.

#### **Constitutional Changes**

It seems to me that from whatever angle one approaches this complicated problem one comes back to the conclusion, just as much in the Union as in the Federation, that constitutional changes are

essential by which both Europeans and Africans would be guaranteed against the passing of unfair discriminatory legislation based on race. Once it has been admitted, as it has been by thinking people of all parties, that Africans must be allowed and encouraged to develop economically, culturally, and politically to the full extent of their capabilities, no other conclusion is possible. It seems to me that there is much more unity on this matter among South Africans than appears on the surface and it may be that a satisfactory way of co-operation between Europeans and Africans in those countries which are and must remain the permanent home of both races, will be found sooner than is often supposed.

It is no good glossing over the fact that both the Union and the Federation face difficult and dangerous problems. Nevertheless, we retain full confidence in their future. Both have great economic potentials and both require a high rate of investment to create the material conditions in which their human problems can be solved. Our Corporation is favourably placed to help provide the risk capital and the technical and administrative skills that are needed. The Union and the Federation have an inspiring task before them and the Anglo American Corporation, in its sphere, can play an essential part in tackling it.

#### **Gold Mining Industry**

Looking back on 1958, it is possible to detect a significant and widespread revival of interest in investment in the gold mining industry. This interest appears to be continuing in spite of the political uncertainties I have mentioned. The loan of £4,262,000 by the Deutsche Bank to the Corporation and the formation of the American-South African Investment Company to acquire shares in South African companies are symptoms of this revival of interest; its yardstick is the considerable advance in the prices of most shares in South African mining and mining-finance companies on the stock markets.

The year 1958 was a record one for production and profits by the South African gold and uranium industry and it was a notable year for new business in this sphere. From this point of view Western Deep Levels takes pride of place. This company's mine will be of exceptional size and opening it up will require an investment of nearly £30,000,000, or more than twice what is normally required for the development of a large mine. A relatively high grade of ore is expected and operations are planned on a very large scale. For these reasons we are confident that this great enterprise will be a highly satisfactory and profitable one for the Corporation.

The picture of the Orange Free State goldfield is a most encouraging one and we are beginning to earn increasing benefits from our large investment there. Although no new mines are at present being opened up by us in that field, there is a great deal of new development taking place on our established properties.

#### **Copper and Diamonds**

The copper mining industry started the year under very difficult conditions. The price of copper fell to as low as £160 a ton in February, 1958, and all



the major producers were faced with the necessity for reducing production to correct the condition of over-supply and to restore stability to the market. Fortunately, during the year the position of the copper industry improved substantially and in October copper reached a price of £240 a ton.

The diamond industry, like the copper industry, started the year 1958 in unfavourable circumstances, but here again, I am glad to say, a marked improvement occurred during the year. At present the demand for diamonds, both gem stones and industrials, is satisfactory. Fundamentally, however, the market for gems is in a sounder position than that for industrials. There are, however, we believe considerable opportunities for increasing the use of diamonds in industry in their present applications

and also for finding new fields for their use. We may confidently expect that the year 1959 will be a sound one for diamonds.

All in all, 1958 was a most successful year for the Corporation. Mainly as a result of an improvement in income from investments, the profit for the year increased by just over £1,000,000. Because of the larger number of shares in issue, unchanged dividends for the year on the ordinary shares of 8s. per share cost nearly £250,000 more than the ordinary dividends paid for 1957. The appropriation to general reserve amounted to £1,500,000 and the general reserve now stands at £24,500,000. By the end of the year the book cost of quoted investments had increased by nearly £2,670,000 and the market value of these investments by about £17,740,000

## SOUTH CROFTY, LTD.

The fifty-third annual general meeting of South Crofty, Ltd., was held on May 21, at Pool, Redruth, Cornwall.

Mr. T. Pryor, D.S.O., M.I.M.M., chairman, presided, and the following is an extract from his statement circulated with the report and accounts for the year ended December 31, 1958:—

During 1958 there have been several changes in the capital structure of the company. By March, 1958, the whole of the First Mortgage Debenture Issue of £100,000 had been taken up and the Debenture Holders agreed to lend a further £17,000 on similar terms. The additional £17,000 was taken up in May, 1958, making the total of that Debenture Issue £117,000.

On August 21, 1958, an Extraordinary General Meeting was held at which the shareholders passed resolutions increasing the authorized capital of the company and also made various alterations in its Articles of Association. Thereafter, the Board of Directors, by a resolution passed on September 25, 1958, created £83,000 6½% Convertible Second Mortgage Debenture Stock, which was offered to the shareholders for acceptance on or before October 22, 1958, with completion of payment of the purchase money by December 3, 1958.

At South Crofty during 1958 75,596 tons were treated, producing 741½ tons of black tin, representing an increase of 4,963 tons treated and 16½ tons of black tin produced. The average price

for tin metal received by the company was £717 per ton, as compared with £725 in 1957 and £760 in 1956. The gross receipts from mineral sales were £366,674, which is an increase of £8,627 over the previous year, but the increase in revenue was more than offset by increased working expenditure caused not only by the greater tonnage of ore mined and treated but also by substantial increases in development work. The gross expenditure on development underground for the year was £74,721. The Profit and Loss Account shows a loss for the year of £51,575, which is an increase of £29,572 over the loss of the previous year. It was not until almost the end of the year that the new treatment plant was able to bring the amount of ore that could be treated to 8,000 tons per month and so increase earnings. Meanwhile the underground labour force had to be kept employed on development work in excess of immediate requirements, for until the preliminary facilities had been completed it could not be transferred to the deepening of New Cook's Kitchen shaft.

As will be seen from the statement by the Managing Director, the exploratory development of the year has given satisfactory results. It has confirmed that important ore-bodies exist in the new northern lodes and on Nos. 3A and 3B lodes a wide ore-body is in course of exploration, with good results. As from the beginning of 1959 the mine has been working at a profit.

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## DE BEERS CONSOLIDATED MINES, LIMITED

*(Incorporated in the Union of South Africa)*

### PROSPECTS OF HIGHER DIAMOND SALES THIS YEAR

#### GROUP'S NON-DIAMOND ASSETS EXCEED £100 MILLION

The following are extracts from the statement by the chairman, Mr. H. F. Oppenheimer, which has been circulated with the report and accounts for 1958.

The sales effected by the Central Selling Organization in 1958 amounted to £65,543,387, of which £49,420,696 were gems and £16,122,691 were industrials. This compares with a total of £76,772,112 for 1957, divided as to £52,818,096 of gems and £23,954,016 of industrials. This shows that there was a very substantial falling-off in sales and it is therefore very satisfactory that our company was able to maintain its dividend and further strengthen its overall position.

At December 31 the net cash assets of the Group totalled £35,884,735, which is only £571,404 less than at the end of the previous year.

While the policy of investing considerable sums outside the diamond industry was continued during the year, there was also a very substantial appreciation in the market value of the investments already made. The Group's non-diamond investments valued at market price in the case of quoted investments and book value in the case of unquoted investments amounted to £64,551,421, an increase of £12,205,595 over the previous year. The total of the Group's non-diamond investments and of its net cash assets amounted to £100,436,156.

#### Williamson Mine

The most important development in our business during 1958 was our purchase jointly with the Government of Tanganyika of the entire share capital of Williamson Diamonds, Limited. The Williamson Mine is an important one, and may be expected to produce about £3,000,000 to £3,500,000 of diamonds per annum.

The arrangements concluded in regard to Williamson Diamonds represent an important strengthening of the structure of the trade. We particularly welcome our partnership with the Tanganyika Government, and are convinced that it is in the interests both of the territory and of the diamond trade as a whole.

I referred last year to the large uncontrolled production by African diamond diggers in Sierra Leone. The large purchases made by The Diamond Corporation, Sierra Leone, Limited, had the effect of keeping the market price of these diamonds steady in spite of the serious recession of the trade

in the first half of the year. Our agreement with the Sierra Leone Government proved itself in this way of great benefit to the territory, and at the same time was an important factor in maintaining the stability of the industry as a whole.

We have, however, long felt that it was desirable to put the arrangements for the marketing of this production on a more permanent and stable basis and one which would be fully acceptable to the individual African diggers. We therefore initiated negotiations with the Government which are still proceeding.

It is proposed to set up a Government Diamond Office through which the whole of this African production will be marketed.

#### Synthetic Diamonds

Last year I mentioned that our diamond research laboratory was embarking on large scale tests of natural and synthetic diamond grit in various diamond grinding operations. These tests have shown that natural diamond grit is greatly superior to the synthetic product in metallic bonded grinding wheels, and also in the cutting discs which are now being used in the large concrete road and airfield programmes in the United States. It is claimed that synthetic grits are more effective than natural diamonds in resinoid bonded wheels. There must, however, be doubt about the significance of such claims on account of widely differing results obtained under varying conditions.

We will shortly be in a position to market a new diamond grit specially prepared for resinoid bonded wheels.

At the present time the demand for diamonds, both gem and industrial, is at a satisfactory level. In the industrial field, however, this is due to a considerable extent to the effect of Government stockpiling. The production of industrial diamonds is, generally speaking, in excess of what is required for current consumption.

One of our associated companies has recently formed a small company in Canada jointly with Engelhard Industries Limited with the object of expanding the use of crushing boart especially in the field of glass-grinding. Our laboratories are also busy on a number of projects designed to increase the demand for other types of industrial stones. We are hopeful that from all this work significant results will be achieved.

The United States continues to consume the greater part of all diamonds which we sell but there has been a tendency lately for the proportion consumed in other countries to increase. Taking all facts into consideration, it appears probable that sales in 1959 will be substantially higher than in 1958 and that our company will have a prosperous year.

## THARSIS SULPHUR AND COPPER CO., LTD.

*Directors:* W. P. Rutherford (*Chairman and Managing*), Lord Glenconner, H. Hogarth, Neil Rutherford, Iain Rutherford, Antoine Velge, James C. Robertson, Robert P. A. Fossorier. *Secretary:* William Johnston.  
*Office:* 136, West George Street, Glasgow. *Formed:* 1866. *Capital:* £1,250,000, in £2 shares.

*Business:* Operates mines in the Huelva district, Spain.

### Mr. W. P. Rutherford's Review

The annual general meeting of the Tharsis Sulphur and Copper Co., Ltd., was held on May 14 at the registered office of the company, 136, West George Street, Glasgow, C. 2.

Mr. W. P. Rutherford, chairman of the company, who presided, said:—

I propose, if you agree, to take the Report and Accounts as read.

### Mines

Reviewing the past year's operations, the salient feature was a reduced market for our product as experienced by almost all other pyrites producers and indeed throughout the mining industry. This affected all our departments by reducing the divisor applied to arrive at unit costs and providing us with a smaller gross income. The situation was met to some extent by increased efficiency and by applying surplus labour to the removal of overburden at our two new opencasts.

Centre Lode, to which I have previously referred, was started as a small opencast scheme during the year under review, and good progress has been made in the removal of overburden. Investigations which were extended to the 5th floor proved the continuation of cupreous pyrites to this lower level, 30 metres below the 3rd floor, and the reserves have in consequence been more than doubled. It has been decided to extend the opencast to the 5th floor and to mine what ore may exist below that level by underground methods. Although work has been hindered by unusually wet weather we expect to start the extraction of this high grade cupreous pyrites later this year.

At North Lode the mineral storage deposit is now finished and the installation of plant will be completed next month. Overburden removal was continued at both the east and north-west of the opencast and some mineral was mined from the eastern scheme. A proportion of this ore is of cupreous grade and its mining, although complicated by the existence of old workings, will be low cost and will help to recompense us for the initial outlay in plant and development. Turning to the north-western section of this scheme, I am very pleased to report that recent investigations indicate a large extension of the orebody, and although it is too early to make any definite statement, I can say that it appears well situated for opencast mining.

The investigation of North Lode in depth from our present producing mine, Sierra Bullones, has confirmed the existence of a northern extension of mineral. The main gallery linking the two mines and the investigation cross-cuts have made good progress, although the final scheme, including the equipping of the North Lode Shaft to handle the underground extraction from both mines will not be finished for some years.

Calañas Mine has operated steadily and the development of the 18th floor is well advanced. An area of cupreous pyrites in the second ore mass is at present being investigated.

We welcome the plans that are being prepared to increase the dredging operations of the bar and estuary of the River Odiel, as some difficulties have been experienced lately with the loading of larger ships, and we hope that an early start will be made to increase the depth of the channel. It is imperative to our trade that the port of Huelva is capable of taking large ships, as recent trends in shipbuilding are towards ships of over 10,000 tons.

You will realize from what I have said about our mines that we have steadily improved our developed reserves and mining capacity, so that we are in the highly satisfactory position of being able to double production to meet an expansion of the market.

On the social side, our house-building programme continues, and although the more pressing need for additional houses has largely been overcome the full need of our villages has not yet been met. At the same time, improvements are being made each year to the older houses. At Tharsis a new church is nearing completion, and will replace the old church which is too small and is not conveniently sited to the village.

### Market

There has been a gradual recession in our markets of Northern Europe during the last three years which was more marked last year. The period of trade recession in U.S.A., particularly, coincides with increasing sulphur production in Mexico from American-owned mines working the Frasch process and from the sour gas development of the Lacq field in France.

This has brought about a competitive position in the sale of elemental sulphur, which has affected the pyrites market, and it was again necessary to reduce the price substantially at the beginning of this year. We are determined that pyrites will be competitive with any sulphur bearing materials and are confident that we shall receive the full support of the Ministry of Commerce in fomenting this very important Spanish industry and export. Last year I spoke of the market position and of the unprofitable level of the controlled price for pyrites delivered in Spain. I myself took an active part in the presentation of the request of the Spanish Pyrites Mines for a higher price in this market at a cordial interview granted by the Minister of Industry last November and I am pleased to report that we were granted a substantial increase by the Minister on January 23 this year. While we are grateful, and I personally take this opportunity of expressing my gratitude to Sr. Planell, it must be said however that the price is still too low in the changed market circumstances.

I must emphasize that pyrites is not sulphur. When sulphur is burnt for the manufacture of sulphuric acid it is wholly converted to gas. When pyrites is burnt for the same purpose 70% of the original weight remains as a residue containing the iron and non-ferrous metals present in the pyrites. This residue is the property of the buyers of pyrites and is sold by them to the copper extraction works.

The value varies with the price of iron ore and the other metals, principally copper, and constitutes a rebate on the f.o.b. price paid. The benefit derived by the pyrites buyers varies according to the cost of transport to the extraction works and the quality of the pyrites, but generally is at least half the f.o.b. cost of the pyrites. I mention this to emphasize the composite value of pyrites as compared to the straight value of sulphur. Nevertheless, both are basic materials in the manufacture of sulphuric acid and pyrites producers have to be alert on price policy.

In recent years furnaces have been developed to raise steam from the waste heat produced by the roasting of pyrites. The earlier types of these furnaces, while efficient, are only suitable for certain classes of pyrites. New furnaces suitable for the type of pyrites generally produced are being designed. The generation of steam as a by-product of the roasting process will give our product an additional advantage and we welcome this progress.

Regarding prospects I can only say that the market shows some improvement so far this year and we are hopeful that this trend will continue.

#### Accounts

As you will see there has been a sharp fall of £97,506 in the net profit due to the recession in the pyrites markets and lower sales prices. When there is a marked reduction in shipments such as we experienced last year higher mining costs are inevitable. You will be interested to know that last month we received notification from the Inland

Revenue that we had qualified for treatment as an Overseas Trade Corporation as from April 6, 1957. This had the effect of releasing a sum of £100,901 previously charged for the fiscal year 1957-58, and this sum has been credited in the accounts before you. Further adjustments in taxation due to operating as an O.T.C. will arise, but these will be of much lesser importance. Your Board has always been conservative as regards dividend policy, but we feel justified in recommending the same distribution as in the previous year, particularly in view of the tax credit. In addition to maintaining the dividend we are able to allocate £100,000 to General Reserve and increase the carry forward by £27,926.

#### Staff

Before concluding, I would like to acknowledge the loyal and capable service given by all members of the staff both in Spain and at home.

I now propose that the Directors' Report and Statement of Accounts for the year ended December 31, 1958, be and are hereby approved and adopted, and that a dividend of 12½% on the capital of the company be now declared, payable less income-tax on and after May 21, 1959.

The report and accounts were unanimously adopted, the retiring directors, Lord Glenconner, Mr. Antoine Velge, and Mr. Iain Rutherford, were re-elected, and the remuneration of the auditor, Mr. Hugh Cowan-Douglas, C.A., was fixed.

The proceedings terminated with a very cordial vote of thanks to the chairman, proposed by Mr. William C. Campbell.

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## THE CONSOLIDATED ZINC CORPORATION LTD.

### Net Income Well Maintained Despite Reduced Revenue from Mining Operations

The tenth annual general meeting of The Consolidated Zinc Corporation Limited, will be held on June 23, at 37 Dover Street, London, W. 1.

The following is an extract from the statement by Mr. L. B. Robinson, the Chairman, which has been circulated with the report and accounts for the year ended December 31, 1958:—

The low lead and zinc prices prevailing at the end of 1957 continued during the first three quarters of 1958 and showed only a slight improvement in the last quarter. The 1958 price levels there can be little profit from mining these metals. In the circumstances I feel we are entitled to regard the results for 1958 as being satisfactory and reasonably encouraging.

The Group profit, before mining royalty and taxation, fell by £1,594,251 which was fully accounted for by the fall in the profit of the Zinc Corporation's mine at Broken Hill, New South Wales.

Consolidated Zinc Proprietary Limited again had a satisfactory year and showed an increase in profit which was largely brought about by the sale of rutile and zircon by Titanium and Zirconium Industries Pty., Ltd., at prices arranged under contracts entered into during previous years.

In the United Kingdom, although the profits from zinc smelting and sulphuric acid production by Imperial Smelting Corporation Limited were lower, the profits from the other products, in particular zinc oxide and other pigments and zinc alloys were reasonably well maintained.

Income from trade investments at £996,293 again showed an improvement.

The consolidated net profit for the year at £1,617,876, was, as a result of the considerably reduced charge for mining royalty and taxation, only £152,110 lower than the net profit for 1957.

The directors recommend a final dividend of 2s. per share, compared with 2s. 6d. per share last year, giving a total distribution for the year of 3s. per share compared with 3s. 9d. per share for 1957.

Since the end of 1958 the group's resources have been augmented by the "rights" issue of 1,455,100 ordinary shares at 48s. per share.

### Lead and Zinc Mining

In view of the prevailing conditions in the metal markets, both the Zinc Corporation and its associated company New Broken Hill Consolidated, budgeted for a reduced production of ore and recoverable metal in 1958 and in February, 1958, working time was reduced by 10% throughout the Broken Hill field as a positive contribution towards the solution of the world problem arising from the fact that the output of lead and zinc is running in excess of demand.

Accordingly, in 1958, the Zinc Corporation treated a total of 659,268 tons of ore for a production of 79,098 tons of lead, 2,033,955 oz. of silver and 115,348 tons of zinc concentrate compared with 767,069 tons of ore for a production of 90,820 tons of lead, 2,198,457 oz. of silver and 139,684 tons of

zinc concentrate in 1957. The 1958 outputs therefore represent reductions of approximately 13% of recoverable lead and 17½% of zinc concentrate.

The policy of reduced production will be continued in 1959 until such time as a more favourable outlook for metals justifies the return to full and normal operating conditions.

### Zinc Smelting

The output of zinc from the United Kingdom plants of Imperial Smelting Corporation was slightly lower than in 1957.

The modernization and expansion programme which was begun in 1957 on the vertical retort zinc distillation plant at Avonmouth, was continued during the current year. By the end of 1958 eight of the 18 retorts had been modified. Zinc metal output from this plant already shows a marked increase.

Operation of the Imperial Smelting process at Avonmouth continued satisfactorily during 1958. The decision to close down the obsolete and uneconomic horizontal distillation furnaces at Avonmouth was carried out by mid-1958.

At Swansea, the construction of the new Imperial Smelting process plant to replace the horizontal distillation plant was commenced in June, 1958, and such excellent progress has been made that the plant should be ready for operation at the end of the present year which is considerably ahead of the preliminary planning schedule. The new plant should add materially to the profitability of our zinc smelting operation in the United Kingdom and will also have the ability to recover lead-metal from the treatment of mixed lead and zinc concentrates.

In Australia, further progress was made during the year with the design of the new smelter to be built at the works of Sulphide Corporation Pty. Limited, at Cockle Creek, near Newcastle, New South Wales. The original plans have been revised in the light of improved results obtained by the Imperial Smelting process plant at Avonmouth.

### Lead Smelting

Lead smelting operations by the Broken Hill Associated Smelters Proprietary at Port Pirie continued satisfactorily throughout the year. The company's results reflect the effects of the lower metal prices but these have been offset to a marked extent by further gratifying increases in operating efficiency. Since July, 1958, some reduction in lead production has been necessary to conform with the reduced mine production at Broken Hill.

### Imperial Smelting Process

The success achieved by the Imperial Smelting process continues to attract considerable attention among lead and zinc smelting interests throughout the world. During 1958 an option agreement to acquire a licence for the process was signed by the Société Minière et Métallurgique de Penarroya and after full investigation this company has decided to exercise its option and has now entered into a licence agreement. Under this licence the process



will be installed at Noyelles Godault in northern France and the new plant is expected to come into operation there in 1961. In January last an option agreement was signed by the Rhodesia Broken Hill Development Company Limited. The metallurgical and operational standards of the process have been proved to the satisfaction of this option holder who is now carrying out in Northern Rhodesia a thorough economic assessment of the process applied to their currently mined ore and available stock of high-grade oxidized products and dump material.

Inquiries from some of the other interested parties have already advanced to the stage of detailed discussions and in a number of cases a fuller appraisal of the process is already being carried out.

#### Zinc Alloys

The production of Mazak zinc alloys was the highest of any peace-time year, due mainly to the continued expansion of the demand from the motor car industry.

#### Comalco

Commonwealth Aluminium Corporation (Comalco)

during the year continued investigation of the many factors involved in the economic assessment of alumina and aluminium production based upon the bauxite deposits at Weipa on the west coast of Cape York Peninsula.

#### Conclusion

The world prices for lead and zinc continue to be the major factor in determining our fortunes. At the time of writing this statement a United Nations Conference on these metals in New York is about to terminate and, until the result of this Conference is known, it is difficult for me to make any useful observations on the future outlook. I hope the picture will be clearer by the date of our annual general meeting, when I propose to review the position in the light of our knowledge at that date.

While the trend of market prices is outside our control there are other factors of great importance to the well-being of the Group which we can influence, namely, the cost and efficiency of our operations. In this connexion the improvements in 1958 in practically all branches of our operations have continued to be encouraging.

## AMALGAMATED BANKET AREAS, LTD.

### Mr. C. J. Burns' Review.

The twenty-third annual general meeting of Amalgamated Banket Areas, Ltd., was held on May 29 in London.

Mr. C. J. Burns, chairman, presided. The following is an extract from his statement circulated with the Report and Accounts for the year ended September 30 1958 :—

The improved conditions mentioned in the review last year have been maintained so that the profit of £162,640 for the year has completely eliminated the debit balance on profit and loss account.

During the year under review production increased by 42,229 tons to 739,760 tons and the grade improved by 0.623 dwt. to 4.872 dwt. per ton. Development footage was practically the same as in the previous year, amounting to 25,354 ft. at a total cost of £198,806. Ore reserves show a decrease of 124,519 tons, but the average grade of the reserves increased slightly from 5.487 dwt. to 5.592 dwt.

#### Chairman's Additional Remarks

The Chairman addressing the meeting, said: In my review I laid great stress on the importance of increased development and I would now like to touch briefly on the development results for the current financial year to the end of April.

#### Abbotiakoona

The 17 W/L drive after negotiating a large traverse fault is being pushed ahead as rapidly as possible and so far shows payable values as 4.7 dwt. over 36 in. for 150 ft. The extent of the pay shoot is unknown but there is every possibility that it extends right across the syncline and it is hoped to push 20 W/L drive north to prove the

downward extension of this shoot as soon as possible.

A diamond drill hole off 2117 crosscut towards the downward extension of the old ore body has revealed an underlap reef between the "C" reef and the old ore body. This shows values of 6.5 dwt. over 36 in. in the West Reef and 10.2 dwt. over 36 in. in the Main Reef. Cross-cutting to this reef has started and the prospects for exploring A.V.S. in depth are very encouraging.

Diamond drilling has disclosed a possible west reef between 17 and 20 west limb levels and cross-cutting from 19 level to prove the extent of this pay shoot is proceeding. There is every indication that this could bring in a large tonnage of pay ore.

#### Taquah Mantraim

The "K" loco haulage is proceeding satisfactorily and 850 ft. has been advanced to date. If this rate is maintained the haulage should be completed by the end of October.

#### Effuenta

Results being obtained here fully justify the cost of the "K" loco haulage and it is hoped that at least 100,000 tons of 4.5 dwt. ore will be available as soon as a holing is made.

It is intended to continue the haulage way southwards below the Tamsoo area and it will ultimately cause the cessation of ore hoisting and ropeway transport from the Effuenta and Tamsoo sections. Substantial savings in working costs will accrue.

All the emphasis at A.B.A. is on development, and we are firmly convinced that with Government assistance we could increase footage considerably and reduce the overall cost per foot of development.

The report and accounts were adopted.



## NEW BROKEN HILL CONSOLIDATED LTD.

### Reduced Output and Low Metal Prices

#### Mr. L. B. Robinson's Review of Activities

The twenty-third annual general meeting of New Broken Hill Consolidated Limited will be held on June 23, at 37, Dover Street, London, W. 1

The following is an extract from the statement by Mr. L. B. Robinson, which has been circulated with the report and accounts:

The low level of lead and zinc prices prevailing at the end of 1957 continued during the first three quarters of 1958 and showed only a slight improvement in the last quarter. The average London Metal Exchange prices for prompt delivery of these metals during 1958 were £72 16s. for lead and £65 18s. 1d. for zinc, compared with £96 13s. 4d. and £81 12s. 4d. respectively during 1957. At the 1958 price levels there can normally be little profit from mining these metals, but due partly to the average assay of the ore produced during the year being higher than that of recent years, partly to a reduction of operating costs and partly to some satisfactory forward contracts, a trading balance of £1,037,063 was achieved, compared with £1,904,035 for 1957.

Depreciation amounted to £350,600 compared with £340,700 for 1957 and, after other charges, the profit before taxation amounted to £696,303, compared with £1,591,313 for 1957.

The company is an overseas Trade Corporation and is subject to United Kingdom income tax (less double tax relief) on its trading income to the extent that this is distributed as dividends. It is also subject to U.K. income tax and profits tax on its non-trading income, less double tax relief. The provision for Australian and United Kingdom taxation on the profits for the year amounts to £219,986 compared with £534,217 for 1957.

The result is a net profit for the year of £476,317 compared with £1,057,096 for 1957.

Taxation provisions in respect of earlier years no longer required, amount to £355,519.

Transfers have been made of £350,000 to general reserve and £150,000 to mine amortization reserve.

The directors are recommending a final dividend of 10d. per share, free of tax, compared with the equivalent of 1s. 8-7d. per share free of tax, last year. This gives a total distribution for the year of 1s. 4d. per share free of tax, compared with the equivalent of 2s. 10½d. free of tax for 1957.

#### Production

As I mentioned in my statement to you last year, in the prevailing conditions of world markets in which a surplus of lead and zinc had developed, the company in conjunction with the Zinc Corporation, Limited, budgeted for a reduced production of ore and recoverable metals in 1958. This policy will be continued until such time as a more favourable outlook for these metals justifies a return to normal operating conditions.

There was a reduction of approximately 27% in the tonnage of ore treated in 1958 and production of recoverable lead during the year was 12% below the 1957 tonnage. Zinc concentrate output was lower by 23%. Despite the substantial reduction in

ore treated the average cost per ton of ore was only slightly higher in 1958 compared with the previous year.

As reported last year, arrangements were concluded with the Unions in February, 1958, for a suspension of operations throughout the Broken Hill field on one day per fortnight, which was later altered to one week in ten weeks. This is equivalent to a reduction of 10% in working time. Nevertheless, the budgeted reduction of output would, in the ordinary course, still have rendered redundant a proportion of our labour force but, in order to do our utmost to obviate this, employees were transferred from production to development. We sincerely hope that we may continue to be able to avoid retrenchments.

The operating efficiency, measured by the output in tons per mining-department-employee-shift at 4-64 in 1958 is below the record level of 5-58 achieved in 1957. A lower tonnage from the sub-level stope and the reduced proportion of men on stoping operations caused this reduction. On the other hand the output per contract-stopping-miner-shift (excluding the sub-level stope) showed further improvement at 19-58 tons as compared with 18-18 tons in 1957 and 16-54 tons in 1956.

The details of production are as follows: Total for 1958 525,492 tons assaying 11-8% lead, 3-1 oz. silver, 12-7% zinc, compared with 722,722 tons assaying 9-8% lead, 2-6 oz. silver, 12-0% zinc in 1957.

The recoveries of lead and silver in lead concentrate and zinc concentrate showed a further satisfactory overall improvement.

The ore reserves fully outlined and developed ready for stoping or in the process of being stoped as at December 31, 1958, were calculated at: 3,600,000 tons assaying 10-5% lead, 2-5 oz. silver, 12-9% zinc, compared with 3,300,000 tons assaying 10-7% lead, 2-7 oz. silver, 12-5% zinc at December 31, 1957.

#### White Leads—Exploration

Preparations were put in hand towards the close of 1958 to dewater the old White Leads mine workings for a programme of underground sampling and general exploration. Active work in these small shallow workings, which are situated on the company's leases approximately 2½ miles south of the main shaft on the general trend of the line of lode, ceased shortly after the termination of World War I.

#### Shaft Developments

Work is in hand on Nos. 21 and 22 Levels to deepen the Service Shaft, which now operates to No. 22 Level, to a depth of approximately 3,832 ft. This will enable the shaft to operate down to No. 26 Level and is part of the programme to open up the lower levels for future mining of the lead lode ore-bodies.

The company and the Zinc Corporation were affected by an agreement made in 1950 which was

interpreted to require that, in the case of retrenchments by any company on the Broken Hill field, employees of any other company who would not have qualified as local men for employment prior to that agreement, would be replaced by local men. Out of the total of 92 employees of the Company and of the Zinc Corporation who were affected, a number left of their own accord but, unfortunately the two

companies have been required under this agreement to arrange for the replacement of 63 men by a similar number of local men retrenched by the other two companies in the field.

The Industrial Agreement concluded in 1956 is due to terminate in July of this year and negotiations with the unions for a new agreement are expected to commence shortly.

## ARISTON GOLD MINES (1929), LTD.

### New Share Issue

#### Mr. C. J. Burns' Speech

The 29th annual general meeting of Ariston Gold Mines (1929), Ltd., was held on May 22, in London. Mr. C. J. Burns, chairman, said :—

I would refer you to the remarks in my statement accompanying the report and accounts, outlining the proposals for the issue of further capital.

The Board has had no doubt for some time past of the necessity for the raising of further money and the only question has been when would be the most appropriate time for such an operation.

Having regard to current market conditions and prospects and following a visit I paid last week to Ghana, when I had the privilege of discussing with Cabinet Ministers and Members of the Government there, it has been decided that the issue should be made forthwith. In consequence all Stockholders registered on the 3rd June, 1959, will receive on or about July 10 next a Provisional Allotment Letter representing 1 share for every 7 shares held by them on the June 3, 1959, and which are being issued at 3s. 3d. per share payable in full on acceptance. Acceptances will be received up to August 7, 1959, which date has been fixed, having in mind the Stockholders who are resident abroad, and to ensure preservation of their rights so far as is possible.

When the issue is completed the company would receive an amount of £208,929 gross and the issued capital of the company would be increased by £160,714 to £1,285,714. On the increased capital the Board feel confident that, in the ordinary course, a dividend of not less than 20% gross will be paid which on the basis of the net profit figures of 1958 would be covered 1½ times. Assuming a dividend of not less than 20% the yield on the new capital at the issue price of 3s. 3d. per share would be approximately 15%.

#### Deep Level Development

As mentioned in my statement the main purpose of raising the new capital will represent the expenditure on the major shaft sinking and deep level development programme now being vigorously pursued. This programme will ensure that continuity of the ore reserves position (which is about five years ahead of the mill), and which will not only preserve the stability of the future output, but will provide that flexibility which is so essential for the most economic working of the mine.

In that connexion, during my perforce all-too-brief visit to Ghana last week I had comprehensive discussions with our general manager, Mr. F. Clelland, and he assured me that the development on the lowest levels of the mine is proceeding well up to schedule and is looking most satisfactory.

We all realize that the present fundamental mining and development operations must be primarily concerned with the main ore-bodies at depth, but it was most pleasing to hear from Mr. Clelland his conviction that the disclosure of a new rich lens on the 13th Level in the North Orebody augurs well for the future of the new section of the mine. So far the length exposed is 344 ft. at an average value of 6.6 dwt. over 131 in. and driving is continuing.

Additionally, the rich zone being explored near surface of the 3rd, 5th, and 6th Levels between our main ore-bodies and the northern limits of the Ghana Main Reef Company's reefs gives encouragement as an indication of, first, an available store of richer ore (limited in tonnage though it may be until it is fully developed), and, secondly, and indication that more extensive development in this area is warranted. In that connexion it could be visualized that if the area opened out into major ore-bodies then your company would proceed with the full opening up and development of this area.

I need hardly say that whenever we have any further news as to these important developments this will be immediately conveyed to Stockholders apart from the usual information covering the actual conduct of operations reported in the customary monthly and quarterly progress reports.

#### Ghana Governments' Appreciation

In the course of my discussions with the Ghana Ministers the opportunity was taken to review the position of the gold mining industry in that country. These discussions to my mind only serve to confirm the views which I have already expressed in my Chairman's Review of this company and also remarks that I have passed in associated companies.

The Ghana Government are appreciative of the work that has been done by Ariston Gold Mines and the contribution they have made towards the prosperity of their country and they have no intention of making that task more difficult. A number of suggestions were made by me to the Government this time and I hope shortly to be in a position to announce further progress in the policy of full co-operation which at present exists.

The report and accounts were adopted.

## RAND MINES, LIMITED

(Incorporated in the Union of South Africa)

### Mr. Charles W. Engelhard's Views on the Future of Gold

At the sixty-fourth ordinary general meeting of Rand Mines, Limited, held on May 28 at The Corner House, Johannesburg, Mr. Charles W. Engelhard, the chairman, in the course of his remarks said:—

Gentlemen—This is the first annual meeting of Rand Mines, Limited, at which I have had the honour to preside, and it is my pleasure to-day to address you as chairman of the company. The directors' report and the accounts for the year ended December 31, 1958, which are now submitted for your adoption, have been in the hands of shareholders for some weeks. In addition to details of your company's activities during the past year the report contains information about the various companies of the Group.

#### Financial Results

As will be seen from the accounts, the profit for 1958 at £1,498,685 was £683,347 more than that for the previous year, but £409,396 of this represented a book profit on the exchange of certain shares for shares in Harmony Gold Mining Company Limited and The Corner House Investment Company Limited. Excluding the latter figure, the increase in profit was £273,951.

Dividends received from investments increased by £173,688, of which about £130,000 is attributable to new and additional investments and the balance to increased dividends paid by various companies. The company was fully invested at the year end, sufficient cash having been retained to meet current requirements while portion of its funds are in investments readily realizable when required for any proposition offering a favourable return. The increase of £84,196 in interest received arose mainly from a loan of £1,000,000 to the Harmony Company.

After allowing for two dividends, one of 2s. 9d. and the other of 3s. per share, transfers of £450,000 to investment reserve and £250,000 to exploration reserve, respectively, an amount of £412,027 was carried forward in the profit and loss account at the end of the year.

Despite the large transfer to investment reserve the balance of £7,305,385 at the end of the year showed little change due to depreciation on certain investments being charged direct to the reserve.

The book value of the quoted and unquoted investments increased by £1,198,782 to £9,527,466 and the Stock Exchange value of quoted investments was £3,916,911 higher at £14,509,938. Our investments in certain of the newer mines have not as yet reached their full dividend potential, while some have still to reach the dividend paying stage.

#### Exploration

The reserve for exploration has been substantially increased because it is anticipated that expenditure on prospecting and exploration will be greater than in recent years. The company has had many

propositions before it during the past year and is at present investigating, either on its own account or jointly with certain other Groups, a total of nine prospects in the Union and neighbouring territories. Six of these are for gold, one is for coal, one is for copper, and one is of a general exploratory nature, principally for copper, cobalt, and gold. Drilling is already being done or is about to begin on a number of the areas concerned. Since the close of the financial year a new company has been registered in Southern Rhodesia for the purpose of examining the mineral—particularly copper—possibilities of nearly 500 square miles in the Karoi District of Southern Rhodesia, over which two prospecting orders have been provisionally granted by the Government. Field work in this large area has been started. One borehole has been completed and a further borehole is in progress. It will be appreciated, however, that much more exploratory work will have to be done before the potentialities of this and other areas can be assessed.

I might mention that it is my view that the long-term future of uranium is unquestionably sound but that, on the other hand, there will be an interim period between expiration of the existing contracts and the full development of uranium for peaceful uses where there will, no doubt, be an oversupply.

There will also be an attempt on the part of uranium producers in various parts of the world to assure the sale of their material because uranium, unlike gold, will have to be sold just like any other commodity. I am convinced that the authorities, both in the industry and in the Government, are fully aware of this and are taking steps to develop the private sale of uranium and I would only like to add that any research which can be done towards the development of additional refining or manufacturing of uranium so that it can be produced in its most saleable form under Union auspices, either here or abroad, will inevitably result in a better sales potential.

#### Future of Gold

Obviously of great importance to Rand Mines is the future of gold and the price of gold. You will, no doubt, however, appreciate that this is a controversial subject and that there is no man alive who can accurately foretell exactly when the price of gold will be changed. It is, however, clear that there has been increasing speculation and discussion on this question, stimulated to some extent by the substantial losses of gold which have occurred in the United States. If these losses continue they will become an increasingly serious matter to the United States and, quite clearly, will give rise to further discussion as to the advisability of changing the gold price. Although these losses are stimulated by foreign aid and loss of trade, it would be wrong at this time to say that there is any basic flight from the dollar because the dollar is still the world's strongest currency and in all probability will remain

so. It is true, however, that it is not as strong as it was and is subject to increasing pressure from abroad where national banks are converting dollar holdings to gold. In my opinion, the basis of a change in the gold price is not, however, so much the possible weakness of the dollar or advantages that would accrue to South Africa by such an increase but rather that such an increase would be a tremendous boon to free world economy particularly if it were coupled with some form of modified gold standard which could result in the elimination of many current currency restrictions thereby greatly increasing the potential flow of trade. There is no question that the world looks on gold as the basic international medium of exchange and no paper currency can replace the value of gold in this regard.

#### Future Prospects

I, like my other colleagues on the board, am most interested in South Africa and its possibilities for industrial and economic expansion, and I feel that the future of the country, and for your company, is full of promise. It remains for us to seek new fields of investment, to conduct our exploration programme energetically and to take advantage of opportunities for expanding the company's interests and business whenever suitable opportunities occur. I can assure you that every effort is being made, and will continue to be made in this direction and it is by belief that your company, which contributed so much in earlier years to the economic development of South Africa, will continue to play a leading part in its future.

### NEW CONSOLIDATED GOLD FIELDS GROUP OF COMPANIES

#### DECLARATION OF DIVIDENDS

NOTICE IS HEREBY GIVEN that the following dividends have been declared payable to shareholders registered in the books of the undermentioned Companies at the close of business on 30th June, 1959.

The dividends have been declared in the currency of the Union of South Africa and will become due on 1st July, 1959. Dividends payable from the London Office will be paid in United Kingdom Sterling currency at par provided that should there be any difference that may be regarded by the Boards as material in the exchange value of the South African and United Kingdom Sterling currencies on 1st July, 1959, the said Office will pay at the rate of exchange ruling on that date.

Dividend Warrants will be posted on or about 6th August, 1959, from either the Head Office or the London Office to shareholders at their registered addresses or in accordance with written instructions received and accepted by the Companies concerned on or before 30th June, 1959. All such warrants in respect of payments to be made to persons with addresses in Africa south of the Equator will be posted from the Head Office and all other such warrants will be posted from the London Office.

Dividend Warrants despatched from the London Office to persons resident in Great Britain or Northern Ireland will be subject to a deduction of United Kingdom Income Tax at rates to be arrived at after allowing for relief (if any) in respect of Dominion Taxes.

Non-Resident Shareholders' Tax of 7½ per cent. will be deducted from dividends, where applicable.

The Transfer Books and Register of Members will be closed in each case from 1st to 4th July, 1959, both days inclusive.

Name of Company (each incorporated in the Union of South Africa)	Dividend No.	Rate of Dividend Amount, per Share
Doornfontein Gold Mining Company Limited . . . . .	5	1s. 6d. per 10s. share.
Libanon Gold Mining Company Limited . . . . .	17	3½d. per 10s. share.
Venterspost Gold Mining Company Limited . . . . .	39	10½d. per 10s. share.
Vlakfontein Gold Mining Company Limited . . . . .	32	11d. per 10s. share.
West Driefontein Gold Mining Company Limited . . . . .	13	4s. 3d. per 10s. share.
West Witwatersrand Areas Limited . . . . .	21	1s. 9d. per 2s. 6d. share.

- |        |   |   |
|--------|---|---|
| NOTES. | 1. RIET FONTEIN CONSOLIDATED MINES LIMITED.<br>THE SUB NIGEL LIMITED.<br>VOGELSTRUISBULT GOLD MINING AREAS LIMITED. | } No dividend declarations have been made by these Companies as it is proposed to make repayments of capital to Members in lieu thereof.<br>Separate announcements in this connection appear elsewhere in this issue. |
|        | 2. ROBINSON DEEP LIMITED.<br>SIMMER AND JACK MINES LIMITED.   |   |
|        |   | } No repayments of capital are presently being made by these Companies.   |

By Order of the Boards,

G. H. WARD,

London Secretary.

9th June, 1959.

London Office: 49, Moorgate, E.C. 2.



## H. E. PROPRIETARY LTD.

(Mining and Industrial Finance)

### Mr. R. Ellerton Binns' Review

The annual general meeting of The H.E. Proprietary Limited was held on June 10 in London. The following are extracts from the circulated statement of the chairman and managing director, Mr. R. Ellerton Binns :—

The group profit for the year ended December 31, 1958, before taxation, was £323,356, an advance of £70,719 on the previous year. Taxation takes £152,278 and after deducting adjustments in respect of the subsidiary companies there remains a balance of £74,862, to which is added £62,470 brought forward, making an available total of £137,332. Dividends totalling 1s. 1½d. per share, against 9d. paid for 1957, absorb £80,438, leaving an unappropriated balance of £56,894 on the profit and loss account of the parent company.

The company's investments in subsidiary companies now stands at £581,012, an increase of £261,934 which arises mainly from the purchase of 1,000,000 shares of 5s. each at par in the wholly owned subsidiary, South African H.E. Proprietary Limited.

In the consolidated balance sheet the increase to £434,082 in the value of fixed assets reflects the continuing expansion of Alumasc Limited.

The statement then refers to the group's United Kingdom activities and continues :—

#### Gold Mining Interests

Our South African gold mines interests are vested in our wholly owned subsidiary, South African H.E. Proprietary, and include substantial holdings in Harmony, Free State Saaiplaas, Luipaards Vlei, and West Witwatersrand Areas.

At Harmony operations continued with satisfactory results. The capacity of the gold reduction plant, which is currently treating 150,000 tons per month, is being increased to 200,000 tons. The extension of the pyrites flotation plant has been completed and a 120 tons per day sulphuric acid plant is in course of erection. Dividends of 1s. 9d. were paid for the year to June 30, 1958, and 2s. 1½d. per share has been paid for the current year.

Operations at Free State Saaiplaas were confined to shaft sinking and to the erection of plant and buildings. Both No. 1 and No. 2 Shafts have intersected the Basal reef, No. 1 Shaft intersecting ore averaging 24.9 dwt. over a width of 28.2 in. and No. 2 Shaft 16.7 dwt. over 15.4 in. These satisfactory disclosures increase our high regard for the property and we look forward with confidence to the results of actual development on the Basal reef. All operations are planned to bring the mine into production by stages, from an initial production of 50,000 tons monthly commencing July, 1960, to 100,000 tons monthly at the end of 1961.

Luipaards Vlei reports another satisfactory year, principally from the production of uranium oxide. For the year ended June 30, 1958, dividends totalling 2s. 2d. per share were distributed and subsequently a half-yearly dividend of 1s. per share has been paid.

During the year South African H.E. Proprietary acquired an appreciable holding in West Witwatersrand Areas, a finance and holding company having large interests in the mines on the so-called West Wits line and also in some of the leading gold mines in the Orange Free State. It also owns extensive freehold properties and mining and mineral rights in the Far Western Rand (West Wits line). For the year ended June 30, 1958, dividends paid total 3s. 3d. per share and an interim dividend of 1s. 9d. per share has been declared for the current year.

In Canada we maintain our appreciable holding in Anglo-Huronian, a strong mining-finance company whose main interest is in Kerr-Addison Gold Mines. That company reported record results for 1958. For the year ended July 31, 1958, Anglo-Huronian paid dividends of 50 cents per share.

In Australia our interest is maintained in Gold Fields Australian Development Company which, through its subsidiary, is working the Mount Ida Gold Mine on a salvage basis. Operations have enabled Gold Fields Australian to make capital repayments to its shareholders and during 1958 we received 1s. per share, making a total capital return to date of 3s. per share. It is expected that a further distribution will shortly be made.

#### "Rights" Issue

The "Rights" offer made last March to members was fully subscribed and 480,000 new shares have been issued, making the total Issued Capital of your company £720,000 divided into 2,880,000 Ordinary Shares of 5s. each. The proceeds of this issue are, we believe, ample for present requirements and provide an adequate working capital after extinguishing the bank overdraft. In the absence of any unforeseen circumstances the directors expect to be able to maintain the same rate of dividend for the current year on the increased capital. Results for the first four months of the new year indicate the maintenance of Group profits at a satisfactory level.

At the annual general meeting you will be asked to pass an Ordinary Resolution increasing the Authorized Capital of the company from £750,000 to £1,000,000 by the creation of 1,000,000 shares of 5s. each.

Colonel R. P. W. Adeane was appointed a director of the company in October last in place of Mr. J. R. Grey, who had resigned his seat on the Board. Colonel Adeane's wide knowledge and experience of company affairs renders him a most useful member of our Board, to which we welcome him.

I trust that this brief review of your company's affairs will indicate its eminently strong position. Its investments at home and abroad are well diversified and its liquid position being satisfactory, the company is well placed to take advantage of any lucrative new business that may be offered.

The Report was adopted.



## WESTERN SELECTION AND DEVELOPMENT CO., LTD.

### Interests in Ghana and Canada

The twenty-ninth annual general meeting of Western Selection and Development Co., Ltd., was held on May 28 in London, Mr. C. J. Burns, Chairman, presiding.

The following is an extract from his statement circulated with the report and accounts for the year ended September 30, 1958:—

The profit, £95,128, compared with £60,171 in the previous year, reflects the improvement in the operating results of our investments in Ghana and the recovery in stock market conditions generally. The directors recommend a dividend of 8%, less tax.

The chairman, addressing the meeting, said *inter alia*: I have just returned from a visit to Ghana and Canada in which countries we have over 88% of our assets.

#### Ghana Investments

Recently I have drawn attention to what I consider to be the opportunities for profitable investment in Ghana. In spite of certain press reports which in the last few days have suggested that the risks inherent in investment in Ghana were great I have not changed my opinion. The most important factor is what actions the Ghana Government take in respect of the mining industry. The Government's actions speak for themselves. They are not the actions of irresponsible Government, nor do they represent the initial stages of nationalization.

Our own interests in Ghana show a marked improvement. Ghana Main Reef was enabled to increase its dividend and operations to date have maintained their more profitable trend. Ariston Gold Mines had a very satisfactory year and the new issue should provide the finance required for the exploitation of the deep levels. Bremang Gold Dredging Company have not published their annual accounts, but the quarterly statements have shown that their profits should be more than doubled. Amalgamated Banket Areas results also

show a marked improvement over 1957 and the debit balance on profit and loss account has been eliminated.

#### Canadian Interests

During my short visit to Canada I had the opportunity of discussing our present and future programmes with our consulting geologists and of appraising the results of our work on our two main properties.

**Genrico Mines.**—Due to the unusually mild weather the break-up at Tow Lake started much earlier than usual this year and so drilling has had to be suspended temporarily in this area. However, the company had already acquired an option on the Smith Tiblemont Gold property in north-western Quebec. To date, just over 4,000 ft. of drilling has been carried out on the property in 13 completed holes. The drilling results have been highly encouraging.

**Cordoba Mines.**—The Cordoba Company obtained the services of Mr. R. A. Shatford, the consulting geologist responsible for bringing in the most successful and profitable gold mine in the Red Lake area, namely Campbell Red Lake Gold Mine. Mr. Shatford stated that the geological controls already established showed that the andesite rocks that had so successfully proved host to ore-bodies at the adjacent Campbell Red Lake and New Dickenson Gold Mines, occurred predominantly on the extensive Cordoba property.

To date his drilling results have confirmed his interpretation. His opinion is that such information if continued will provide evidence to warrant 20,000 ft. to 40,000 ft. of further drilling, only a small part of which should be necessary to locate major ore occurrences. All this is most encouraging and justifies the programmes planned and carried out by our Canadian subsidiary.

The report and accounts were adopted.

## An Introduction to Mineral Dressing

By E. J. PRYOR, A.R.S.M., D.I.C., M.I.M.M.

650 Pages

233 Illustrations

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## THE MINING MAGAZINE

### RIETFontein CONSOLIDATED MINES LIMITED

(Incorporated in the Union of South Africa)

#### CIRCULAR TO MEMBERS

#### THIRD REPAYMENT OF CAPITAL—6d. PER SHARE

Dear Sir (or Madam),

As Members are aware, the capital of the Company has been reduced from 5s. per share to 3s. 2d. per share by repaying to Members 1s. and 10d. per share in September, 1958, and March, 1959, respectively. The authorized capital is now £197,916 13s. 4d. in 1,250,000 shares of 3s. 2d. each and the issued capital is £177,689 18s. 0d. in 1,122,252 shares of 3s. 2d. each.

The Directors recommend that as and when funds become available for distribution to Members they should continue to be distributed by way of repayments of capital, instead of in the form of dividends, for so long as it remains in the interests of the majority of Members to do so.

The present arrangements for making repayments of capital to Members are, however, cumbersome and necessitate the passing of Special Resolutions and the obtaining of the approval of the Court on each occasion that it is decided to make such a repayment. In order to reduce both expenditure and administrative work the Directors are of the opinion that it will be to the advantage of all concerned if the procedure can be simplified.

Such simplification will be achieved, provided the Court approves, by the passing of a Special Resolution reducing the capital of the Company from the present amount of 3s. 2d. per share to a purely nominal amount of 3d. per share and at the same time authorizing the Directors to make repayments of capital of amounts up to a total of 2s. 11d. per share, on condition that no paid up share capital shall be repaid unless it is in excess of the wants of the Company and provided that no amount shall become due and payable until it has been declared to be so by the Directors, and provided further that such amounts shall be paid to Members on dates to be determined by the Directors.

The Directors recommend that the procedure for repaying capital to Members should be simplified along the lines suggested above. The necessary Special Resolutions are set out in the Notice convening an Extraordinary General Meeting of Members to be held on 10th July, 1959, which accompanies this Circular.

In the event of the Special Resolutions being passed by Members at the aforesaid Extraordinary General Meeting an application will be made to Court as soon as possible thereafter asking for confirmation of the proposed arrangements. Upon confirmation by the Court it is the intention of the Directors to repay on or about 18th September, 1959, an amount of 6d. per share to Members registered in the books of the Company at the close of business on 28th August, 1959.

London Office :

49, Moorgate, E.C. 2.  
9th June, 1959.

By Order of the Board,

G. H. WARD,  
London Secretary.

#### NOTICE TO MEMBERS OF EXTRAORDINARY GENERAL MEETING

NOTICE IS HEREBY GIVEN that an Extraordinary General Meeting of Members of the Company will be HELD in Consolidated Gold Fields Building, 75, Fox Street, Johannesburg, on Friday, 10th July, 1959, at 10 a.m. for the following purposes :—

To consider and, if deemed fit, to pass with or without modification and in the manner required by the Companies Act, 1926, as amended, for the passing of Special Resolutions, the following resolutions as SPECIAL RESOLUTIONS, viz. :—

1. " THAT the authorized capital of the Company be reduced from £197,916 13s. 4d. divided into 1,250,000 shares of 3s. 2d. each to £15,625 divided into 1,250,000 shares of 3d. each and that the issued capital of the Company be reduced from £177,689 18s. 0d. divided into 1,122,252 shares of 3s. 2d. each, fully paid, to £14,028 3s. 0d. divided into 1,122,252 shares of 3d. each fully paid, and that the Directors be and they are hereby authorized to give effect to such reduction by repaying to Members registered in the books of the Company at dates to be determined by the Directors, paid up capital, up to an amount of 2s. 11d. on each of the 1,122,252 shares, which have been issued, in such amounts and at such times as the Directors in their discretion may decide, provided that no paid up share capital shall be repaid unless it is in excess of the wants of the Company and provided that no amount shall become due and payable until it has been declared to be such by the Directors."
2. " THAT the Chairman for the time being of the Company or any one of the Directors be authorized to apply to a competent Court for confirmation of the said reduction and to take all steps necessary to render it effective."

The reasons for and effect of the aforementioned Special Resolutions are contained in the attached Circular to Members.

The Transfer Books and Register of Members of the Company will be closed from 7th to 10th July, 1959, both days inclusive.

A Member entitled to attend and vote at the above Meeting may appoint one or more proxies to attend and speak and, on a poll, vote in his stead. A proxy need not be a Member.

London Office :

49, Moorgate, E.C. 2.  
9th June, 1959.

By Order of the Board,

G. H. WARD,  
London Secretary.

THE MINING MAGAZINE

VOGELSTRUISBULT GOLD MINING AREAS LIMITED

(Incorporated in the Union of South Africa)

CIRCULAR TO MEMBERS

REDUCTION OF CAPITAL, FIRST REPAYMENT—11d. PER SHARE

AMENDMENT OF ARTICLES OF ASSOCIATION

Dear Sir (or Madam),

**Reduction of Capital.**—In view of the contraction of the scale of operations at the Company's Mine, mentioned in the Chairman's Statement issued on 13th May, 1959, the Board of Directors considers that the time has arrived when it will be advantageous to Members to distribute amounts derived from future working profits in the form of periodical capital repayments instead of in the form of dividends. Such repayments are free of taxation in the hands of most Members whereas dividends are subject to taxation in the hands of some Members.

As a result of a recent Court order the procedure for repaying capital can now be greatly simplified if a Special Resolution is passed reducing the capital of the Company from the present amount of 10s. per share to a purely nominal amount of 3d. per share and if at the same time the Directors are authorized to make repayments of capital to Members of amounts up to a total of 9s. 9d. per share on condition that no paid up share capital shall be repaid unless it is in excess of the wants of the Company and provided that no amount shall become due and payable until it has been declared to be such by the Directors, and provided further that such amounts shall be paid to Members on dates to be determined by the Directors.

The necessary Special Resolutions are set out in the Notice convening an Extraordinary General Meeting of Members to be held on 3rd July, 1959, which accompanies this Circular.

In the event of the Special Resolutions being passed by Members at the aforesaid Extraordinary General Meeting an application will be made to Court as soon as possible thereafter asking for confirmation of the proposed arrangements. Upon confirmation by the Court, it is the intention of the Directors to repay on or about 18th September, 1959, an amount of 11d. per share to Members registered in the books of the Company at the close of business on 28th August, 1959.

**Amendment of Articles of Association.**—Members will also be asked at the Extraordinary General Meeting to pass a Special Resolution to amend Article 95 of the Company's Articles of Association.

The reason for submitting this Resolution to Members is that the existing Article 95 requires a Director of the Company to hold shares in the Company to the nominal value of £100.

As it is proposed to reduce the capital of the Company from the present amount of 10s. per share to a purely nominal amount of 3d. per share it would be necessary for each Director to acquire an additional 7,800 shares in order to qualify as a Director. By substituting the proposed new Article 95 for the existing Article Directors would continue to hold the same number of shares as at present.

London Office :

49, Moorgate, E.C. 2.

9th June, 1959.

By Order of the Board,

G. H. WARD,

London Secretary.

NOTICE TO MEMBERS OF EXTRAORDINARY GENERAL MEETING

NOTICE IS HEREBY GIVEN that an Extraordinary General Meeting of Members of the Company will be held in Consolidated Gold Fields Building, 75, Fox Street, Johannesburg, on Friday, 3rd July, 1959, at 11 a.m. for the following purposes :—

To consider and, if deemed fit, to pass with or without modification and in the manner required by the Companies Act, 1926, as amended, for the passing of Special Resolutions, the following Resolutions as SPECIAL RESOLUTIONS, viz. :—

**Resolutions Nos. 1 and 2—Reduction of Capital**

1. " THAT the authorized capital of the Company be reduced from £2,750,000 divided into 5,500,000 shares of 10s. each to £8,750 divided into 5,500,000 shares of 3d. each and that the issued capital of the Company be reduced from £2,514,285 10s. 0d. divided into 5,028,571 shares of 10s. each, fully paid, to £62,857 2s. 9d. divided into 5,028,571 shares of 3d. each, fully paid, and that the Directors be and they are hereby authorized to give effect to such reduction by repaying to Members registered in the books of the Company at dates to be determined by the Directors paid up capital, up to an amount of 9s. 9d. on each of the 5,028,571 shares, which have been issued, in such amounts and at such times as the Directors in their discretion may decide, provided that no paid up share capital shall be repaid unless it is in excess of the wants of the Company and provided that no amount shall become due and payable until it has been declared to be such by the Directors."
2. " THAT the Chairman for the time being of the Company or any one of the Directors be authorized to apply to a competent Court for confirmation of the said reduction and to take all steps necessary to render it effective."

**Resolution No. 3—Amendment of Articles of Association**

3. " THAT the Articles of Association be amended by the deletion of Article 95 and the substitution thereof of the following Article 95 :—

The qualification of a Director shall be the holding of 200 shares in the Company."

The reasons for and effect of the aforementioned Special Resolutions are contained in the attached Circular to Members.

The Transfer Books and Register of Members of the Company will be closed from 29th June to 3rd July, 1959, both days inclusive.

A Member entitled to attend and vote at the above Meeting may appoint one or more proxies to attend and speak and, on a poll, vote in his stead. A proxy need not be a Member.

London Office,

49, Moorgate, E.C. 2.

9th June, 1959.

By Order of the Board,

G. H. WARD,

London Secretary.

## THE MINING MAGAZINE

### THE SUB NIGEL LIMITED

(Incorporated in the Union of South Africa)

#### CIRCULAR TO MEMBERS

##### SECOND REPAYMENT OF CAPITAL—1s. 6d. PER SHARE

Dear Sir (or Madam),

As Members are aware, the capital of the Company has been reduced from 10s. per share to 8s. 6d. per share by repaying 1s. 6d. per share to Members in March, 1959. The capital of the Company is now £753,046 17s. 6d. in 1,771,875 shares of 8s. 6d. each.

The Directors recommend that as and when funds become available for distribution to Members they should continue to be distributed by way of repayments of capital, instead of in the form of dividends, for so long as it remains in the interests of the majority of Members to do so.

The present arrangements for making repayments of capital to Members are, however, cumbersome and necessitate the passing of Special Resolutions and the obtaining of the approval of the Court on each occasion that it is decided to make such a repayment. In order to reduce both expenditure and administrative work the Directors are of the opinion that it will be to the advantage of all concerned if the procedure can be simplified.

Such simplification will be achieved, provided the Court approves, by the passing of a Special Resolution reducing the capital of the Company from the present amount of 8s. 6d. per share to a purely nominal amount of 3d. per share and at the same time authorizing the Directors to make repayments of capital of amounts up to a total of 8s. 3d. per share, on condition that no paid up share capital shall be repaid unless it is in excess of the wants of the Company and provided that no amount shall become due and payable until it has been declared to be so by the Directors, and provided further that such amounts shall be paid to Members on dates to be determined by the Directors.

The Directors recommend that the procedure for repaying capital to Members should be simplified along the lines suggested above. The necessary Special Resolutions are set out in the Notice convening an Extraordinary General Meeting of Members to be held on 3rd July, 1959, which accompanies this Circular.

In the event of the Special Resolutions being passed by Members at the aforesaid Extraordinary General Meeting an application will be made to Court as soon as possible thereafter asking for confirmation of the proposed arrangements. Upon confirmation by the Court it is the intention of the Directors to repay on or about 18th September, 1959, an amount of 1s. 6d. per share to Members registered in the books of the Company at the close of business on 28th August, 1959.

London Office :

49, Moorgate, E.C. 2.

9th June, 1959.

By Order of the Board,

G. H. WARD,

London Secretary.

#### NOTICE TO MEMBERS OF EXTRAORDINARY GENERAL MEETING

NOTICE IS HEREBY GIVEN that an Extraordinary General Meeting of Members of the Company will be held in Consolidated Gold Fields Building, 75, Fox Street, Johannesburg, on Friday, 3rd July, 1959, at 9 a.m. for the following purposes :—

To consider and, if deemed fit, to pass with or without modification and in the manner required by the Companies Act, 1926, as amended, for the passing of Special Resolutions, the following resolutions as SPECIAL RESOLUTIONS, viz. :—

1. " THAT the capital of the Company be reduced from the sum of £753,046 17s. 6d. divided into 1,771,875 shares of 8s. 6d. each, fully paid, to the sum of £22,148 8s. 9d. divided into 1,771,875 shares of 3d. each, fully paid, and that the Directors be and they are hereby authorized to give effect to such reduction by repaying to Members registered in the books of the Company at dates to be determined by the Directors, paid up capital, up to an amount of 8s. 3d. on each of the 1,771,875 shares, in such amounts and at such times as the Directors in their discretion may decide, provided that no paid up share capital shall be repaid unless it is in excess of the wants of the Company and provided that no amount shall become due and payable until it has been declared to be such by the Directors."
2. " THAT the Chairman for the time being of the Company or any one of the Directors be authorized to apply to a competent Court for confirmation of the said reduction and to take all steps necessary to render it effective."

The reasons for and the effect of the aforementioned Special Resolutions are contained in the attached Circular to Members.

The Transfer Books and Register of Members of the Company will be closed from 29th June to 3rd July, 1959, both days inclusive.

A Member entitled to attend and vote at the above Meeting may appoint one or more proxies to attend and speak and, on a poll, vote in his stead. A proxy need not be a Member.

London Office :

49, Moorgate, E.C. 2.

9th June, 1959.

By Order of the Board,

G. H. WARD,

London Secretary.

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The Transfer Books will be closed from 10th to 12th June, 1959, both days inclusive, and the dividend will be paid on 30th June, 1959, to shareholders registered on 9th June, 1959, and to Holders of Coupon No. 77.

NOTICE IS ALSO HEREBY GIVEN to Holders of Share Warrants to Bearer of the Ordinary Shares of the Company that Coupon No. 77 will be paid in London by the Midland Bank Limited, New Issue Department, Poultry, E.C. 2, and in Paris by Lloyds Bank (Foreign) Limited, 43, Boulevard des Capucines, on and after 30th June, 1959.

Coupons must be left at either of the above addresses to permit of eight clear days for examination in London.

By Order of the Board,  
 C. L. WATERHOUSE, *Secretary.*

49, Moorgate, London, E.C. 2.  
 4th June, 1959.

Note: For the year to 30th June, 1958, dividends paid were:—

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Apply to Director of Recruitment, Colonial Office, London, S.W. 1. State age, qualifications, and experience. Quote BCD 99/32/02.

## Government of Tanganyika

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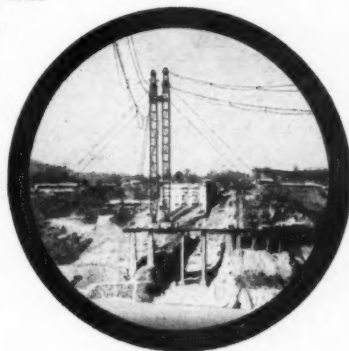
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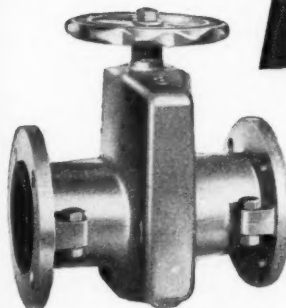
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